SEVENTY-THIRD YEAR

# SCIENTIFIC AMERICAN

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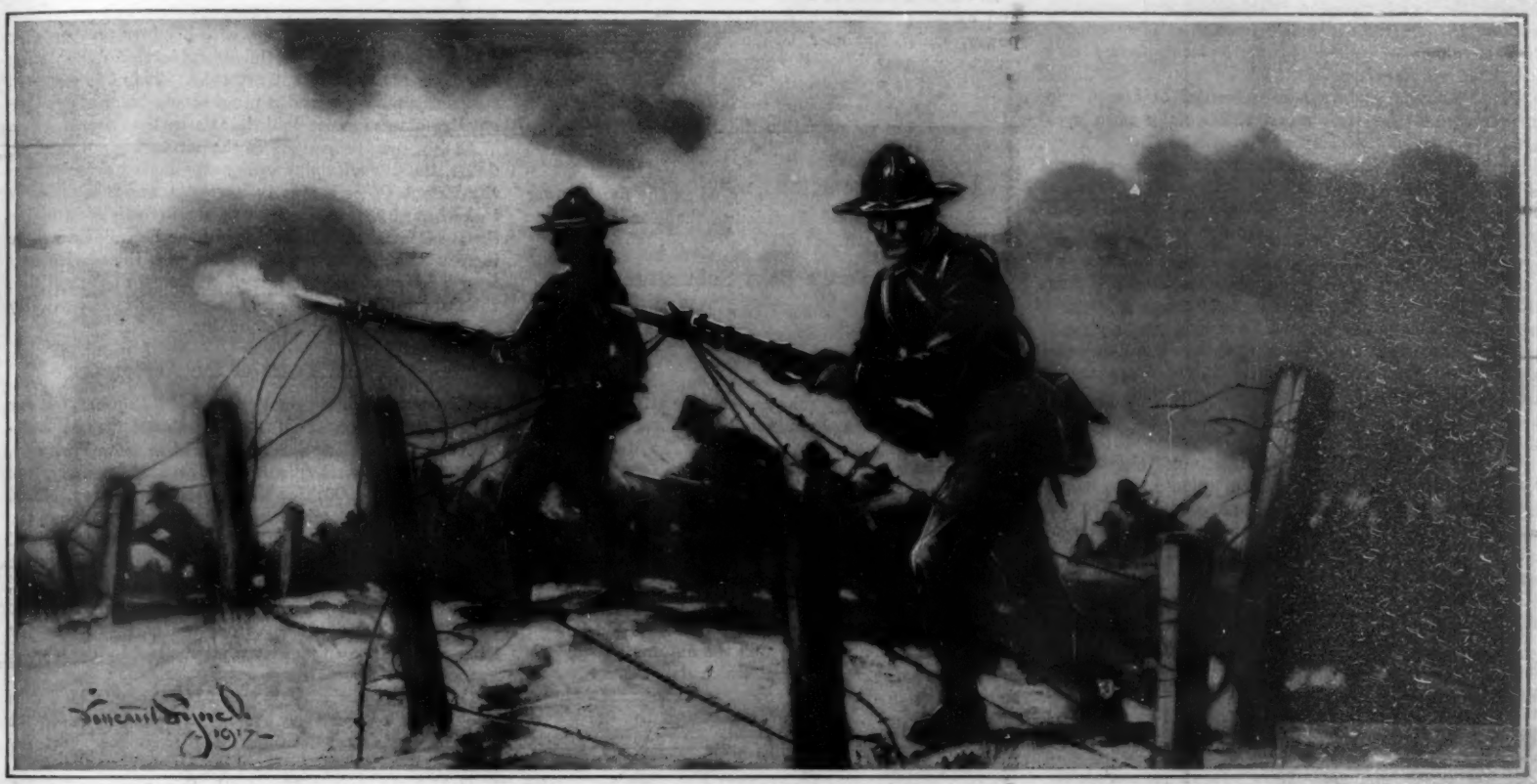


Using the recently invented wire shooter, these infantrymen are depicted in the act of "shooting" their way through barbed wire entanglements

## Breaking Through Barbed Wire Entanglements with the Wire Shooter Cutter

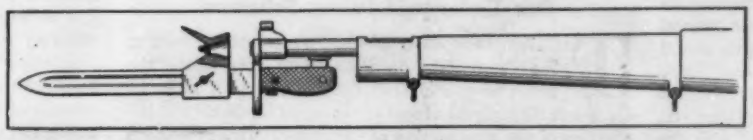
THE barbed wire entanglement is the most formidable obstacle a modern infantry attack has to contend with, and it is largely for the purpose of reducing the barbed wire entanglements of the enemy that a heavy artillery fire precedes an infantry attack in the present trench warfare. Even so, there is always, or nearly always, sufficient barbed wire left in place seriously to interfere with the passage of certain sections of infantry across "No Man's Land."

With a view to facilitating the destruction of barbed wire entanglements by charging infantrymen, an ingenious little device, which its inventor chooses to call a wire shooter cutter, has been developed. It is the invention of Joseph A. Steinmetz of Philadelphia, Pa., who has a number of military inventions to his credit.

Briefly, the wire shooter cutter consists of a closely fitting steel block which is slipped over the blade of the bayonet, in the case of the infantry rifle, or over the muzzle of a pistol or revolver, and held in place by a set screw. The block has upon its upper rear side an integral lug provided with a forwardly converging aperture alining with the bore of the gun, and at its smaller end its diameter is nearly that of the bore. From this forward end of the lug diverge downwardly and upwardly integral, relatively narrow, wire-guiding projections, the upper one being preferably relatively slender and pointed, since it has only a guiding function In use, whether the user be prone or otherwise, the gun is thrust forward until an entanglement wire is engaged between the projections and brought to the forward end of the block and directly across the opening. The gun is then fired, the ball instantly severing the wire, or even, as experiment shows, a rod of several times the usual diameter of a barbed wire or cable. The space between the block and the muzzle allows gases to escape laterally, so that neither gun nor soldier is endangered; and the velocity of the ball and gases is so high that inertia prevents any strong tendency of the block to move forward bodily. Further, the inventor claims that the device does not seriously interfere with the effectiveness of the shot, at least, not at moderate distances, where no wire is to be cut.

In the case of pistols or revolvers, the wire shooter cutter is of a slightly altered design, which is made necessary by the use of soft lead bullets in this type of weapon. The wire is cut by a steel member which is provided with a front cutting edge and a recess at the rear to receive the bullet, this steel slug being shot forward upon the impact of the lead bullet.

Obviously, the function of the present wire cutter is to cut barbed wire entanglements at the height of an infantry charge, and not when silence and secrecy are necessary, such as during a night raid. In the present war in Europe it has been demonstrated that wire entanglements are met with at all times and very generally throughout the firing zone, and when the troops are charging and their position is known, and when, in the din of battle, there is no objection to the noise arising from firing the rifles, the shooter cutter should be an efficient device for infantry troops who might not be equipped with shears and tool cutters. Being a detachable device and weighing but a few ounces, the shooter cutter could be easily carried in the pocket or clamped to the belt or bandoleer, and slipped on the bayonet when the infantry troops found themselves enmeshed in barbed wire entanglements, in but a few moments' time.



The wire shooter designed for use on the bayonet of a standard military rifle

The objection to the present method of cutting with pliers during an infantry attack is that the rifle must be slung to give freedom to the hands, while the infantry man is exposed to enemy fire. With the shooter cutter, on the other hand, the charge need not be retarded and the rifle, although available as a wire cutter, is also available for instant use

Another point in favor of the wire cutter is that the soldier can approach the entanglement by creeping and crawling, and push the rifle upwards, while remaining himself in a recumbent position, and cut the wire by shooting without danger to himself.

## Where Does the Malaria Germ Winter?

MALARIA has a typical seasonal occurrence, with little or no appearance during the winter months. Whether the germ of this disease passes the winter in the bodies of human beings or of mosquitoes, or both, has been the subject of much discussion. A recent Public Health Bulletin, by M. B. Mitzmain, reports extensive investigations carried out in Mississippi from February to June, 1915. A search for Anonpheles mosquitoes disclosed no eggs, larvæ, or pupæ, and led to the conclusion that only the female insects hibernate. More than 2,000 insects were dissected and examined, and were found not to harbor malarial parasites; whereas out of 1,184 human beings examined, 492 were found to be carriers of these germs. Hence the opinion of most previous students of the subject was confirmed; viz., that man and not the mosquito is responsible for perpetuating malaria from season to season. Thus a simple method of ridding mosquitoes of malaria suggests itself—exterminate mankind, and malaria will vanish from the earth!

## Danger in Filtering Gasoline

STATIC charges of electricity of considerable magnitude may be produced when gasoline is filtered through chamois skin and other insulating filtering mediums Greater charges result when the air is dry and cold than when it is warm and damp Recent experiments at the Bureau of Standards show that in cold, dry air it is extremely difficult to avoid the production of such charges, if the gasoline is filtered through chamois skin, but that the use of fine wire gauze in place of the latter practically eliminates the danger. In addition to the electric charge produced by filtering, charges may be produced by the friction of clothing against the cushions of automobile seats, by gloves against other objects, etc. The danger due to charges produced in either of these ways may be avoided by touching the funnel against the metal tank at some distance from the opening before inserting the funnel, and then inserting it into the opening in the tank in such a way that it remains in metallic contact with the tank throughout the filtering process. These two precautions, says the Bureau of Standards, prevent the accumulation of charges of opposite sign on the funnel and the tank, respectively, and eliminate the possibility of the passage of an electric spark between them.

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*The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.*

*The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.*

## The Government Expert and the Lay Critic

THE SCIENTIFIC AMERICAN has always believed that, broadly speaking, it was best to leave the determination of technical questions, affecting the Army and Navy, to the experts of the two Departments; and for many years we have held pretty closely to this belief, in spite of no little pressure from the outside, from people who believed that these gentlemen were too autocratic in their attitude—too little inclined to listen to any suggestions which came to them from the civilian world.

We are too well aware of the waste of Government funds and the misdirection of Government effort, which have resulted in the past from Congressional interference with the work of our technical bureaus, to be guilty of any effort to promote distrust in the gentlemen who design the guns and emplacements for our coast batteries, and the ships which some day may have to hoist the battle flag of the United States Navy.

As a rule, the members of the various tenchnical bureaus, both of the Army and Navy, are selected from the highest graduates in what are confessedly the most thorough schools of instruction in the world—West Point and Annapolis. From personal contact during the last twenty years, the writer can state that he has met no professional men who are more completely wedded to their work, and are more earnestly desirous of securing for their country the very best material that good designing and excellent workmanship can produce.

Nevertheless, it goes without saying, that no body of men, however expert, is infallible and it may well happen that now and again the lay critic, because of his breadth of outlook and his freedom from those traditions of the past, which exert a strong influence over the man who devotes his lifetime to a special line, may be able to offer suggestions which are of very real value, and apply to the work of these bureaus a helpful constructive criticism which, it seems to us, should always be welcomed.

As instances of such civilian criticism, the validity of which has been proved by subsequent developments, we call to mind our criticism of the action of the War Department when it lowered the velocity of our Coast Defense guns from 2,500 to 2,100 feet per second; and of the Navy Department, when it built the useless monitors of the "Talahassee" class; when it adopted the double-deck turret on the ships of the "Kearsage" and "New Jersey" classes; and our criticism of its failure to build battle-cruisers at the time when other leading nations were adding them in large numbers to their fleets. In these, and other cases, the course of events has proved that the attitude which we took was based upon sound strategical and tactical grounds.

Now, our attitude on these questions was not intended to imply, and did not imply, any lack of confidence on our part in the staff officers who are entrusted with the creation of our naval and military materiel On the contrary, we believe that ship for ship, of the same date, the vessels of our Navy are at least the equal, and in some respects the superior, of foreign ships. And it certainly is not for want of confidence that we are now taking, and feel it our duty to take, a decided stand against the construction of battle-cruisers, which embody in their design a technical defect which violates one of the most fundamental principles of warship design. We refer, of course, to the fact that in our new battle-cruisers one-half of the boiler plant, representing 90,000 horse-power in the aggregate, is to be placed above the water-line, where it will be exposed to quick destruction by the heavy shells of the enemy.

The loss of these boilers (and they would go very early in the fight) would represent the price which we would pay for installing a certain type of motive power in the engine-room, a type known as the electric drive. Now if this drive were the only type that could be used, we would say well and good, let it go in and let us risk the loss of the boilers. But we cannot forget there are two other well-proved types of drive, the hydraulic type, to which the German Navy is committed, and the gear drive, used in our own and the British Navy. The fact that these two greatest navies afloat are using these other types, is to us convincing proof that they must be satisfactory. We are willing to admit, for the sake of argument, that the electric drive may have some advantage over the German and English systems, let us say, in economy and ease of manipulation; but seeing that we have not quite lost our sense of proportion, we cannot help feeling that to sacrifice half the motive power for some relatively insignificant advantages such as these, is to violate that ancient and common sense maxim, which affirms that you should not let "the tail wag the dog."

In our fast scouts of equal speed to the battle-cruisers, and carrying half their horse-power, or 90,000 horse-power, Chief Engineer Griffin has not hesitated to employ the gear drive, thereby placing his official sanction upon it as a perfectly reliable drive for high-powered ships; and what is puzzling the lay mind just now is by what process of ratiocination the Admiral arrives at the conclusion that a drive which is suitable for a 90,000 horse-power scout is unsuitable for a 180,000 horse-power battle-cruiser, particularly when the horse-power transmitted through each pinion of the gear is the same in the one ship as in the other.

## Mr. Ford's Baby Submarine

SPEAKING of suggestions that are offered by civilians to the Navy Department, we are free to confess that the naval officers who have to pass upon these suggestions have our sympathy, if they are confronted with many schemes such as that for a baby submarine which has germinated and borne fruit in the fertile brain of Mr. Henry Ford. The daily papers have had a good deal to say about Mr. Ford's "pill-box" submarine, which we are inclined to believe must be first cousin to the "baby submarine" which this gentleman once assured us would quickly sweep all existing battleships out of existence. We presume that by this time Ford's little warship has been developed by him to perfect working efficiency. When the Editor saw and talked with him some eighteen months ago, the idea was apparently only inchoate in the automobile maker's mind. But the description which he then gave us suggested such omnipotent destructiveness at such an infinitesimal cost, that we are satisfied the baby submarine of 1915 must be at least a very near relative of the pill-box submarine of 1917.

"You people," said Mr. Ford, "with your big battleships, are working on the wrong lines. I can build a little fellow, turning him out as fast," with a wave of his hand to the great factories across the way, "as I turn out motors over there. Carrying a man apiece, they will run out below the biggest battleship afloat, touch off a bomb beneath it, and blow the ship out of existence."

Mr. Ford is not the first inventor who has been led astray by the belief that in naval warfare it is possible to get something for nothing. The idea of some small cheap, inconspicuous weapon of destruction, built by the thousand, at next to nothing per dozen, always has been and apparently always will be most attractive to the inventor who believes that it is as simple a matter to build a device to sink a battleship, as it is to build a trap to catch mice. The history of naval construction is full of the record of devices as futile as this of Mr. Ford, and the public would be amazed if it realized the amount of time and trouble that have been consumed by our naval officers in patient examination of these devices and in making plain, by correspondence, their uselessness for naval work.

## Our Under-paid Patent Solicitors

THE Senate recently adopted a resolution directing the Committee on Patents to investigate the needs of the Patent Office respecting both its force and its equipment and to report to the Senate at the opening of the next session of Congress. This resolution was adopted in response to the vigorous protest registered by Commissioner Ewing in his last annual report, against the neglect of the Patent Office by Congress.

The Patent Office is self-supporting, dividend-paying branch of the Federal service and yet it has come in for far less attention than other departments which are an annual expense to the Government. The personnel of the Patent Office is inadequate to handle the work that has been piled upon it in recent years.

The Commissioner reports that in 1890 there were 159 Assistant Examiners who had to make searches and report on 251 applications each, while last year there were 324 Assistant Examiners each reporting on 210 applications. At first this would seem like a 17 per cent reduction of labor; but in 1890 the field of search included 1,078,000 foreign and domestic patents, while last year the total was 2,900,000 patents, an increase of over 240 per cent. The force relative to the work is therefore less than 50 per cent of that of 1890.

Not only is there a lack of men, but those trained for the highly specialized work of examining patent applications do not receive adequate compensation for their services; hence they use the Patent Office merely as a training school, from which they may graduate into more lucrative positions as patent solicitors.

The duties of the Patent Office Examiner demand unusual qualifications. Not only must he have a legal turn of mind, but he must have a technical bent as well. He must become a specialist in the particular division to which he is assigned. He must become familiar with the art in that division. He must be thoroughly acquainted with what inventors have done in related arts so as to confine the claims of a patent to the proper bounds and prevent them from conflicting with patents which to the lay mind might seem to be entirely unrelated. All this calls for a special training, long experience, and a good memory. By the time the Examiner has become valuable to the Patent Office, he realizes that he can do as well financially, with brighter prospects for future success, by leaving the official service and entering the office of some patent attorney. This has occurred time and time again and is proof conclusive that our Patent Examiners are not paid the salaries that they deserve. With the present shrinkage in the purchasing power of the dollar, the difficulty of keeping experienced examiners in the Patent Office is greatly increased, and it is sincerely to be hoped that as a result of the investigation of the Senate Committee, the salaries of the Examiners will be increased to a point commensurate with the service they are rendering to their country. We must not forget that the Patent Office represents the progress of our country in almost every branch of industry.

## Fourteen Years of the Aeroplane

IT was a fortunate thought indeed that prompted one of the exhibitors at the First Pan-American Aeronautic Exposition, recently held in New York city, to exhibit the first practical aeroplane, namely, the Wright flier of 1903; for that historic aeroplane, placed at the head of the stairs leading from the entrance to the main Exposition floor, first attracted the attention of each and every visitor. He stopped to study it, noting not only its general design, but its crude, makeshift, yet ingenious, construction. Then he passed on to the other exhibits of the aeroplanes of to-day, all the more prepared to appreciate what the last fourteen years has meant in aeronautic progress.

The Wright flier of 1903 was a biplane, provided with two propellers driven by a 12-horse-power engine through chain transmission. The single occupant lay prone and balanced the machine by moving the cradle by which he was held. With this machine, in the clandestine fastness of the sand dunes at Kitty Hawk, N. C., Wilbur and Orville Wright began their trials with a power-driven aeroplane. On December 17th, 1903, they made two flights each, the last and longest being 850 feet. Orville was the first man in the world to fly, Wilbur the second; but it was to the latter that the honor of the longest flight of the day, fell.

Like nothing else in the world that Wright machine tells of the pioneer efforts in aviation, and, by contrast, tells what has been accomplished in a short space of time. It tells why aviation claimed so many victims in the opening days of heavier-than-air flying, and why the aviator's work to-day is perhaps no more dangerous than that of the structural iron worker.

The early aeroplanes were built; the aeroplanes of to-day are manufactured. Therein is represented the history of aviation to date. The early machines were constructed in a haphazard manner, not because the builders were not sincere in their efforts, but because they did not realize the stresses which their craft would be subjected to in actual flight. They did not know the meaning of a factor of safety; they made their machines just strong enough to withstand what they considered ordinary conditions. What happened because of these conditions is a matter of history—a list of some one hundred men or more who lost their lives because their mounts did not possess surplus structural strength to withstand the unexpected.

The machines of to-day are manufactured; quantity production methods prevail in many of the larger aeroplane shops. And the designers take nothing for granted. They have figured the stresses which their machine may be subjected to under the most adverse flying conditions, and have multiplied these stresses by six or more. Thus every part is subjected to at least six times the severest strain under flight conditions—this is the factor of safety—and it must stand up under this test or be rejected. The materials, too, are selected for their strength; for defective material may mean the life of the aviator. It is this work, more than anything else, that has made flying comparatively safe; it is this applied knowledge on the part of the constructor that enables men to fly in gales of 50 miles an hour, when winds of one-fifth that velocity would have prevented the most intrepid flier of 1909 from attempting to fly

In sum, the aviator of to-day knows his mount and knows what it will stand; and the pioneer flier of yesteryear did not, and so he often attempted the impossible

## Electricity

**Ice Harvesting by Electricity.**—In the harvesting of ice at Sandusky (Ohio), which is one of the largest natural ice centers in the Lake region, electricity has been used to a great extent this year. Electricity is being used in the operation of practically all the hoisting, storing and loading machines.

**Electrical Course for Women.**—A course, it is understood, will be given at the University of California in household electricity for women, states the *Electrical World*. Attention will be given to the manufacture, repair, and use of electrical household conveniences and will include, besides demonstrations, practice in repairing appliances. The course, it is thought, will be given both in San Francisco and Oakland.

**New Type of Heating Pad.**—There has been recently developed a new form of electric heating pad in which the heating element is wound on India mica with asbestos paper firmly cemented over it, and then incased in a metal covering It is claimed that there is no stress or strain in the heating element wire, as all pulling, twisting and bending comes on a braided copper cable composed of 72 No. 36 gage wires. Another novel feature is a safety link placed inside the pad in circuit with the thermostat. This device keeps the circuit closed through a little spring held in place by a fusible alloy which melts and allows the circuit to open in case the temperature of the pad rises to an unsafe degree

**Electricity from the Wind.**—The electrical engineering department of the State Agricultural College of Manhattan, Kan., is at present engaged in conducting a series of experiments with a view to improving the prevailing methods of generating electricity from windmill power. In the present tests the generator is mounted on the head of the mill and geared directly to the source of power, instead of being belted to the mill at its base, as is usually the practice. The main need at present seems to be a mill that requires a lower wind velocity to start than those now available, since the latter are idle for long periods at a stretch, and therefore necessitate the employment of large storage batteries.

**Preventing Birds from Grounding Lines.**—It so often happens that a bird, seeking a suitable perch and finally deciding on the lightning arrester of a high-potential transmission line, short circuits or grounds a supply system, that any means of avoiding this frequent occurrence is of immediate interest. A means is offered by the simple device invented by the superintendent of a Southern railway and power company. It consists of two fiber pieces or blocks which are slipped over and firmly clamped in place on the horns of the lightning arrester. These blocks are placed near the bottom so that the upper part of each horn is unprotected; but since the upper part of the gap is too wide to be bridged by the body of a bird, no harm can be done by a bird alighting upon the horn thus protected.

**A Pocket Lamp That Carries Its Own Power Plant.**—An engineer of Budapest, Hungary, has devised a pocket lamp in which the current is supplied by muscular power instead of a battery. In shape and intensity of light, the new lamp is said to equal the ordinary pocket flash lamp. The thumb moves a small lever outside the case, which on being depressed and released springs back to its original position. This movement is transmitted through a ratchet and pawl to a set of pinion gears which drives a small dynamo, the field of which consists of a permanent magnet. Obviously, it is necessary to keep on moving the lever with the thumb as long as the light is required, but the energy stored up in the spring is sufficient to maintain the light for a few minutes after the movement of the lever has ceased. When the design is carried out in a heavier form as a hand lamp, the lever is actuated by squeezing two parallel handles attached to the case, one of which is fixed and the other movable. The principle can also be applied to other purposes, such as blasting machines.

**The Swiss Electrical Industry** is a thriving one despite the European war. Lighting requirements have produced a large field of work in the making of filaments and incandescent lamps by special factories for electroliers. Large factories furnish these articles in large quantities and are occupied with the installation of train and motor car lighting. Switches for staircase lighting with electric or manual winding and time arrangement also are made in Switzerland. The thermoelectric industry has found a very fertile field in the little Republic, and the industry is on a scale which has developed exports of thermoelectric products. Two main branches may be distinguished—electric heating and cooking. Besides these may be mentioned as a specialty the production of heat for mounting tires of wheels and for welding. In the heating of carriages, as well as buildings, ribbed heating units, or those with open wire radiators, and heating carpets are in use. The heating units may be attached permanently or made portable and provided with a flexible cord and a two-pin wall plug. Heating of churches in northern countries by electric energy has been successfully carried out by Swiss firms.

## Astronomy

**Seeking a Transneptunian Planet.**—Probably most astronomers believe in the existence of at least one planet, and perhaps more than one, outside the orbit of Neptune. M. Borelly, of the Observatory of Marseilles, is one of those who have searched for such a planet. He has employed mainly a comet-seeker, which shows stars down to the 12th magnitude. He now suggests that the transneptunian planet may be of lower magnitude, and might be found by photographic means, but not by means of single photographs, such as show in the course of a relatively brief exposure of the movement of comets and asteroids. The unknown planet has, of course, a slower motion than Neptune. If its period is a little more than double that of the latter, its apparent motion would be only 1 degree a year, or about 10 seconds a day.

**Harvard College Observatory.**—On a recent visit to the Harvard Observatory, Dr. J. van der Bilt, of the University Observatory, Utrecht, Holland, stated that, in the course of a series of observations on SU Persei, one of the comparison stars, B.D. + 56° 547, had frequently shown fluctuations in brightness. He requested that a number of photographs might be placed at his disposal by means of which he could confirm this variation. In an examination of 135 plates, comparisons with two adjacent stars showed a variation amounting to nearly a magnitude. Since, however, the suspected variable is of Type K 5, and gave images which were often found to be more hazy than those of the comparison stars, both of which are white stars, Miss H. S. Leavitt, of this Observatory, undertook more accurate measurements. Using four white and two red comparison stars, she measured 14 plates on which Dr. van der Bilt had found the star bright, and 14 others on which he had found it faint. The white comparison stars gave a variation between 9.9 and 10.6 (0.7 magn.), while the red stars gave the limits 9.8 and 10.4 (0.6 magn.). The variability of the star, therefore, seems to be established.

**Ultraviolet Light from the Sun and Stars.**—Prof. Dr. Kr. Birkeland has made extensive studies on the variation in intensity of the ultraviolet radiation from the sun, and is an advocate of the view that this kind of radiation, more than other light waves, is an indication of the sun's general electric activity. In a suggestive article contributed to the *Cairo Scientific Journal* he calls attention to the desirability of making simultaneous measurements of ultraviolet sunlight at stations several hundred miles apart, in order to determine which of the recorded variations are due to changes in the absorbing power of the earth's atmosphere and which are solar. He also suggests an extension of such observations to the stars. The proposed apparatus includes a very large parabolic mirror, either made of Mach's mirror metal or coated with nickel, as the reflecting power of a silver mirror is very slight for ultraviolet light. The light gathered by the mirror is directed through a silver filter upon a photoelectric cell, with registering apparatus. In studying the stars he proposes to use two of these instruments at the same observatory, and make simultaneous registrations of the ultraviolet light from two stars. The registered light curves would show some fluctuations that were similar, because due to identical atmospheric conditions, but also some that were dissimilar. The latter, when differentiated out from the former, would give information as to the electrical state of the stars in question.

**A New Method of Determining Star Colors.**—Photovisual magnitudes of stars are the visual magnitudes determined by a photographic process An isochromatic plate is used, combined with a yellow filter, instead of the ordinary photographic plate used for determining photographic magnitudes. The difference between the photovisual or visual magnitude of a star and its photographic magnitude is known as the star's "color-index," and is commonly used as a measure of the star's color. The color of a star may be determined also by spectroscopic methods. A new method recently proposed by F. H. Seares, of the Mount Wilson Observatory, consists of determining the ratio of exposure-time necessary to produce photographic and photovisual images of the same size. An isochromatic plate exposed behind a yellow filter gives the photovisual image, and the same plate without filter gives the photographic image. As it is not feasible actually to produce images of the same size, a single photovisual image is compared with a series of three or four photographic images, the exposure-times of which increase in geometrical progression. The diameters of the latter series, or their scale readings, are plotted against the logarithm of the exposure, and from the nearly linear curve thus derived can be read the exposure-time for a photographic image of the same size as the photovisual. The ratio of the interpolated exposure thus obtained to that which produced the photovisual image compared with similar ratios for stars of known color gives the color-index or color-class of the star.

## Industrial Efficiency

**How Pencil Holders Save Money.**—A leading American railroad is presently urging its employees to use pencil holders on the grounds of economy. Ordinarily, the company points out, the pencils are thrown away when they have been used down to the last third, whereas with the use of a pencil holder they may be used down to the last inch. In the case of a large organization such as a railroad company, the saving presented in using the pencils down to the last inch amounts to thousands of dollars annually.

**The Day of the Mechanical Milker.**—It is reported that the time saved by the use of the mechanical milker increases with increase in the size of the herd. Thus with herds of 15 cows or less the average time required to milk a cow by hand is a fraction over seven minutes; by machine a fraction under five minutes. With herds of over fifty cows it takes slightly under seven minutes to milk a cow by hand and but 4.15 minutes by machine. With herds of over fifty cows one man with a machine milks on the average about twenty-eight cows per milking as against 17 where the milking is done by hand, and with increase in the size of the herd the cost per cow of hand milking changes very little, while the cost per cow of machine milking decreases rapidly. This is indeed the day of the mechanical milker in the case of the large dairy farm.

**An Efficient Gas Producing Plant.**—In a paper read by Prof. E. C. C. Baly, before the Liverpool section of the Institute of Chemistry, the author described a gas producing plant at Portadown, Ireland, in which peat has been successfully used as fuel. The following figures are typical of the results obtained by the above process with peat containing fifty to sixty per cent of water. One ton of theoretically dried peat gives altogether from 88,000 to 92,000 cubic feet of gas. Of this 39,000 cubic feet is used in the preheaters, leaving 49,000 to 53,000 cubic feet in excess. From this excess are developed 700 to 750 horse-power hours. Further, from seventy to eighty-five per cent of the nitrogen is obtained as ammonia and the yield of tar is from three to six per cent.

**Railroads to Sell Old Paper.**—It is learned that the officials of several railroads having terminals in New York are considering methods for meeting the paper shortage by utilizing many tons of paper contained in old office records, which, heretofore, have been destroyed at certain intervals by burning, under the rules imposed by the Interstate Commerce Commission. It is now proposed that instead of burning the paper a process be devised to obliterate the records, after which the paper may be sold and remanufactured. The plans also call for the collection of newspapers and other paper waste on trains and in the stations. The Lehigh Valley Railroad has issued instructions to trainmen and station men to gather all waste paper which they find. Four baling machines and a pulp machine have been purchased for marketing this stock.

**The Principal Causes for Decay in Building Timbers,** according to the *Canadian Engineer*, fall, roughly, under the six following heads: (1) Placing non-durable timber in moist, ill-ventilated basements or enclosures beneath the first floor, or laying sills in direct contact with the ground. (2) Embedding girders and joists in brick or concrete without boxing the ends. (3) Placing laminated flooring in unheated buildings in a green or wet condition. (4) Covering girders, posts, or laminated flooring with plaster or similar coating before being thoroughly dried. (5) General use of non-durable grades of timber in a green or only partially seasoned condition. (6) Use of even dry timber of low natural durability in buildings artificially humidified to a high degree, as in textile mills. A further element of danger lies in the use of timber infected during storage, or which has become infected through neglect after purchase and delivery.

**Spain's New Fuels.**—The fuel question has become of such importance of late in Spain that practical experiments are being made by which various materials hitherto considered of small value may be employed to a certain extent as a substitute for coal. For many years in the rice raising provinces of Spain rice husks have been utilized as fuel for heating boilers in the rice mills, but this practice does not completely exhaust the combustible matter of the husk. The plan is now being tried of forming the husks into briquets by mixing with tar and submitting to hydraulic pressure. The husks at present are sold in sacks of about forty-four pounds, costing from one cent to four cents a sack, according to season. As even large quantities yield comparatively little heat, their use in natural form is expensive. Another briquet is now being made from inferior qualities of lignite. Even lignite dust and waste which were formerly discarded as useless and an encumbrance are treated to expel latent volatile matter and then petroleum residues or similar binding material are added. These briquets are said to possess the advantages of igniting readily and burning with little smoke.

Scraping the gut to free it of the portions that cannot be used

Spinning the gut into thread

# When the Surgeon Sews

## The Manufacture of Catgut for Hospital Use in France

By Jacques Boyer

NOWADAYS the surgeon gets but little rest. To assure the victories of his knife, knowledge and skill alone do not suffice. Equipment is a third requisite—it is necessary for him to have the very best of tools, the perfect antiseptic, the purest of anæsthetics. Even then, after he has successfully cut into the vitals of his patient, his efforts are worse than lost unless he is able to sew up the wound with catgut, upon which he can rely implicitly for sterility, strength and suppleness, so that he may effect the most delicate of sutures without fear of secondary infection.

The production of ligaturing thread possessing these three indispensable qualities, known to the initiated as the "Three S's," is not without its technical difficulties. A process assuring excellent sterilization of the catgut may weaken its tensile qualities, while other modes of manufacture sacrifice suppleness to strength. But all these pitfalls have been carefully removed from the path by investigators under the authority of the École Superieure de Pharmacie, who have been at great pains to work out a new standardized process for the preparation of this indispensable material. We describe this, as applied in the shop of one of the largest Paris firms devoted to the manufacture of catgut for commercial purposes generally.

Catgut is made from the small intestines of sheep. These are composed of three membranes—the outer or peritoneal known to the trade as "gossamer," the internal or mucous, which is designated as "scrapings," and the middle or muscular coating, formed of tough fibers. The last alone is utilized, the other two layers being altogether waste product

As soon as the animal is killed, its intestine is purged of blood, bile, fecal matter and all adhering fat, and is then put on ice and conveyed immediately to the factory. There it is first thrown into a large tub of cold water, in which wooden crossbars prevent it from rising to the surface. After this bath comes the scraping. Standing before a slightly inclined table, into which a marble slab is fitted, the worker spreads one end of the gut out on this and, holding it with her left hand, scrapes it longitudinally with a small piece of reed. In this way the internal or mucous membrane is detached, falling into a basin of stone running the length of the room. The "gossamer" is then torn off by other workers, after which the gut, reduced to about a twentieth of its original volume, consists entirely of tough, fibrous muscular membrane.

Splitting the gut after all the refuse parts have been removed

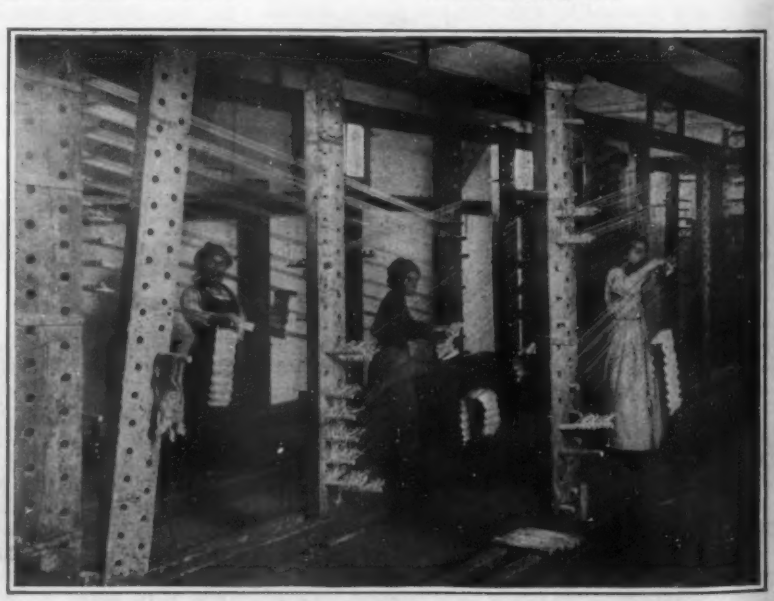
It is now plunged into vessels of varnished sandstone filled with an alkaline solution, and in this taken to the splitting room. The latter process consists in cleaving the gut longitudinally, from end to end. It is done with some sort of a knife, varying in the different factories. In the one of which we speak especially, the intestinal tube passes out of the water and over a light zinc guide attached to a vertical post. A horizontal wooden finger projects toward this post and away from the worker, and is backed by a sharp blade, placed vertically. The tube is drawn over this wooden finger like a glove, and having been thus dilated is neatly divided into two halves as it passes the knife. To facilitate the work there are two long metal ears at the edge of the table next the operator, and once having got the cleavage started, she merely lays the separated ends across these and continues the splitting process by gently pulling toward herself with both hands. The resulting pieces are put to soak in a solution of sodium carbonate or caustic soda. In In order to avoid bacteriological development, all the operations up to this point should be completed on the same day.

After thorough soaking and washing, the thongs of gut now are placed for forty-eight hours in a bath of half-and-half solution of peroxide, for further sterilization. They are then impregnated, by hand manipulation, with a substance that strongly resists putrefaction and makes subsequent disinfection easier. The nature of this substance is not given; its use is necessitated by the ease with which the gut, once sterilized, is found to become reinfected during the process of spinning into thread, which follows.

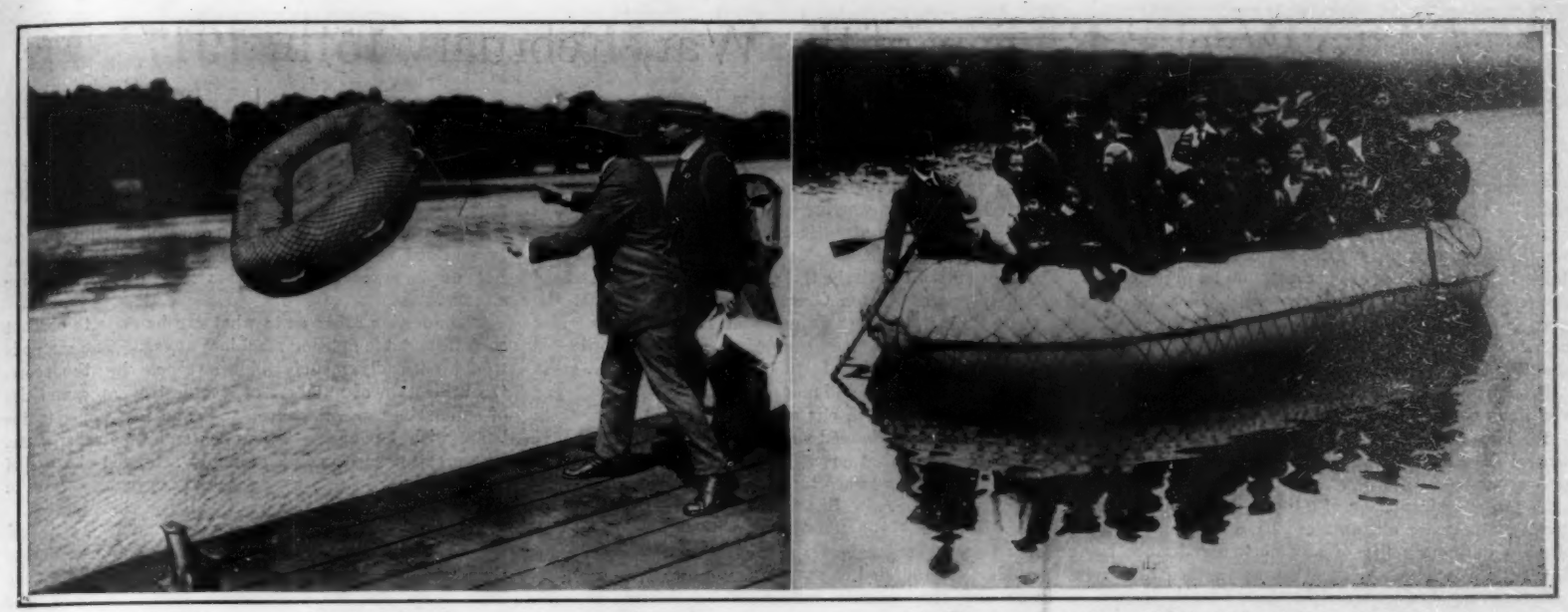
For the latter operation the thongs are placed two, three, four or five together, and attached at one end to a little spinning machine consisting of two geared wheels and a crank to turn them. With the other ends attached to wooden pegs this crank is worked by the operator

(Continued on page 207)

The drying frames



Polishing the finished threads



Launching the new collapsible life-boat brought out in Germany

Public test of the larger boat of identical construction

## A Collapsible Lifeboat That Looks Like a Doughnut

EUROPEAN inventors at the present time have their faces turned toward devices for destroying lives and property; but for all that, they are still capable of moving in the opposite direction. As a matter of fact, the problem of saving friendly lives should occupy as large a place as that of killing the enemy, even in the calculations of the most cold-blooded practical militarist.

It is in this connection that one Herr Meyer of Berlin has worked out the collapsible lifeboat which we illustrate. When folded up this craft is easily carried in an ordinary knapsack; and it can be unpacked, inflated and placed in the water in two to three minutes.

In its essential lines this boat, as the illustration shows, is an inflated rubber torus with the central space occupied by a wooden platform. It is two yards long and a yard wide; and although its total weight when folded and packed is but 15 pounds, its carrying capacity is estimated at 660 pounds. Moreover, since the surplus pressure in the rubber tube is only one-third atmosphere, the air, in case of injury, escapes with extreme slowness, giving ample time to close any ordinary hole with a stopper.

The passengers may move the boat along either with the aid of oars or by paddling with the hands. In case of an excessive load there is no danger of tilting; the boat, by reason of the vacuum beneath its floor, sucks fast to the water and can only sink in deeper, maintaining its true level. Along the outer rim are a number of loops to which floating persons may cling without materially reducing the carrying capacity of the boat itself. Launching is the simplest thing in the world; the boat is merely flung overboard, and its symmetric construction makes it a matter of indifference which surface it settles upon. In addition to this small craft, the inventor is now at work upon a boat of much larger dimensions, which is being tested out at the present time with great success. This model weighs 220 pounds, and is designed to carry a load of 22,000 pounds. Twenty feet long by ten feet wide, it will accommodate 50 passengers inboard and a 100 more perched upon the rubber tube.

The small boat, collapsed and packed in a knapsack

## The Navy's New Radio Station at Chollas Heights, Near San Diego

WITH a message of congratulations and greetings from Mayor Edwin M. Capps of the city of San Diego, Cal., to Secretary of the Navy Josephus Daniels, and a cordial reply from the latter, the new Naval radio station at Chollas Heights, near San Diego, was placed in commission January 26th. This event marks the completion of the most powerful plant of its kind in America, even being far ahead of the great station at Arlington, Va.

The occasion of the dedication of the San Diego station brought to that city a number of men prominent in radio work in and out of the Naval service, and among them were Lieut.-Commander George Sweet, Lieut. Commander Stanford Hooper, aide to the chief of the Naval radio service; Lieut. Ernest Swanson, port commander; Dr. L. W. Austin, chief radio expert of the Navy Department and the Bureau of Standards, one of the greatest authorities in the world on radio-telegraphy. Vice-President and General Manager H. P. Veeder and Superintendent H. L. Burross represented the Federal Telegraph Company, who manufactured the wireless equipment installed at the station.

At the San Diego station there are three 600-foot towers, containing a million pounds of fabricated steel, which are the largest radio aerial towers in the world. They are triangular in section, and have a width of 150 feet at the base and 8 feet at the apex. They are placed 1,100 feet apart. The bases of the legs of the towers are insulated with porcelain, imbedded in concrete.

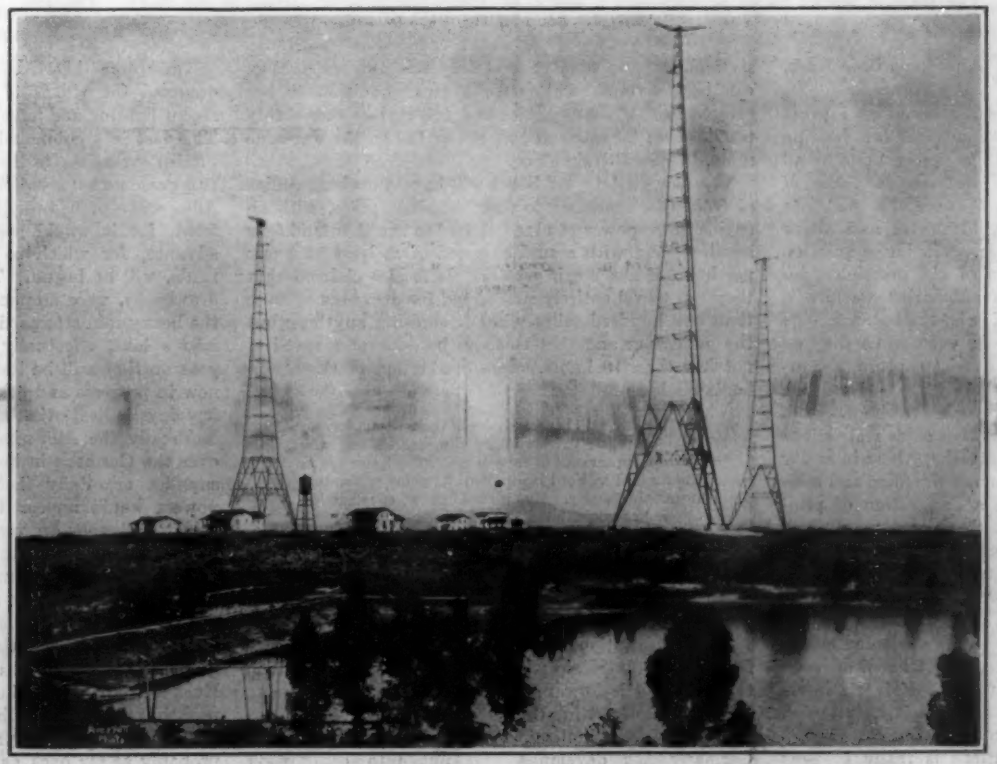
The weight of the antennæ, or aerial wires, is 16 tons and of their own weight the wires have a sag of approximately 100 feet between the towers. The helix has a diameter of 14 feet and a height of 11 feet. The generator has a weight of 60 tons, while each of the three 100-kilowatt transformers weighs 2,800 pounds.

For grounding there has been put down approximately 25 miles of piping and copper cable within the 72 acres comprising the radio reservation.

At the station have been erected a group of six buildings in mission style to be used as quarters for the officers and enlisted men on duty and the housing of the sending and receiving instruments and the generators.

The radio apparatus installed is known as the Poulsen system of radio transmission, invented 11 years ago by Valdemar Poulsen, the patent rights for which in the United States are held by the Federal Telegraph Company. The Poulsen system employs a direct current arc of from 600 to 1,000 volts, burning in a closed chamber of hydrogen, the terminals being placed at right angles in a powerful magnetic field. A 200-kilowatt, 1000-volt direct current generator, driven by a 300-horse-power, 2200-volt 60-cycle induction motor, furnishes the electric current for the set.

The San Diego station represents an expenditure by the Government of $300,000, and about two years have been occupied in the erection and equipping of the plant. The station has the necessary powerful apparatus for sending messages over a distance of 12,000 miles, and can receive from a like distance. The messages between the station and Arlington on the opening day were sent by Lieut.-Commander Hooper, who used a silver-plated telegraph key prepared for the occasion and later presented to him as a souvenir. Lieut. John Ashley will be the commanding officer of the San Diego station, and will have a capable corps of radio electricians under him in carrying out the station's work.



General view of the new Naval station at Chollas Heights, just outside of San Diego, California

# Two Weeks' Review of the War, February 15th, 1917

**By Our Military Expert**

ALL military considerations have largely given way of late to discussions of submarine warfare, barred zones" and "safety lanes." The questions at issue refer not only to the use of submarines and their methods of attack, but also to the much discussed but not very well defined "freedom of the seas' under international agreement. The original proposals under this head were caused by "paper" blockades, and to avoid all misunderstanding most neutrals in war have demanded about as follows:

1 Free passage of neutral ships from port to port and along coasts of combatant nations.

2 The inviolability of an enemy's goods under neutral flags and in neutral ships excepting such goods as were contraband of war.

3 An exact definition of a blockaded port, a merely "paper" blockade not enforced by a sufficient number of ships in the vicinity of any particular harbor being declared inadmissible. In other words, neutrals claim as before stated, that the right should be recognized to use the open seas as channels of communications for trade and passenger purposes not connected with the war at issue, this trade and passenger traffic between neutrals being unrestricted in any way. So far as belligerents are concerned, trade can be in all goods not strictly contraband.

These rights of neutrals, however, are denied by both Great Britain and Germany in the present war, and as a consequence great injustice and real injuries to neutrals in person and property have been inflicted by both belligerents.

From the beginning of the war Great Britain has endeavored to restrict all trade between neutral powers and the Central Allies. In fact, in 1915, that country stated that it would confiscate all goods of presumed enemy destination, ownership or origin; this was in answer to the German proclamation of a war zone around the British Islands.

At the Hague Conference in 1907 it was agreed by all nations taking part that:

"The postal correspondence of neutrals or belligerents, whatever its official or private character may be, found on high seas on board a neutral or enemy ship, is inviolable."

This provision is, so far as Great Britain is concerned, a "scrap of paper," as is seen on every hand, even private correspondence in neutral mails on neutral ships bound to and from neutral ports being opened and censored. Neutral ships are seized, taken into British ports, and cargoes condemned and sold.

Germany is worse, as neutral ships have been sunk, carrying down mails, cargo, crew and passengers.

All of these happenings will render necessary a great revision after this war of all international law bearing upon a declaration of principles to be agreed upon by all nations, covering the rights of neutrals in times of hostilities. These principles must cover the questions of contraband of war, convoys, blockades and above all, the limits of submarine warfare. The latter question will involve the new application of old principles, for the burning question to-day in submarine warfare is the safeguarding of the lives of non-combatants. As long as unarmed merchant vessels, even when they do not carry contraband of war, nor resist capture, nor attempt to escape, are sunk, sometimes with all hands on board or sometimes with their crews left to the mercy of the sea in open boats, it is evident that some restrictions must be placed upon submarine attacks; these in realty should be allowed only against enemy warships and military transports. How far such a declaration of principles can be enforced must lie with an agreement of all nations upon the questions mentioned above—for instance, the question of contraband to be settled by a league of nations and not by Germany or Great Britain or France, as in the present war.

How an unoffending neutral may be subjected to the greatest hardships by the present methods of each belligerent nation being a law unto itself in its interpretations of rights under international law, is shown in the case of Holland, which country, by the latest moves on the part of the warring nations is really brought almost to the verge of starvation; her ships have been sunk, her trade destroyed, and her economic condition is now most precarious. Yet, as a people, she has had little or no real interests involved in the questions at issue between the warring nations. In her note of protest Holland calls attention to the fact that the barred zone established in the Mediterranean by the German decree cuts off entirely the passage between Port Said and the passage from Gibraltar to Greece, so that the route through the Suez Canal to her East Indian colonies—so essential to her commerce and prosperity—is entirely closed. This is but one instance of a great wrong and injury to an innocent neutral.

In connection with our own country and its protests against the latest barred zones established by Germany, it would appear that not a single nation will acknowledge Germany's new warfare to be in accordance with international law. Spain, Brazil, Chili, Uruguay, Argentine, Peru, Bolivia, Cuba, Panama and China follow in our footsteps in strong protests and in support of our attitude. Surrounded as they are by powerful nations at war and consequently influenced by motives of self-preservation, the smaller neutral continental nations of Europe can do little otherwise than protest. But it is understood that all have entered or will enter their protests in due time.

How far Germany can carry out her decrees with submarines and how many of the latter she has available for the Atlantic and Mediterranean barred zones, are not known. Some have argued that the largest number available would be 300, but a conservative estimate would be probably one hundred and fifty to one hundred and seventy-five of the three types; ocean going, coast and mine laying. However, a recent newspaper has placed the number under contract at various works in Germany, to be ready by May 1st of this year, at about six hundred and ninety; certainly this number, if they can be delivered, will prove a great addition to her present fleet of submersibles and will replace thoroughly the losses so far estimated at 110 or 120 on the war zone around Great Britain alone.

The new model "U" boats will have a cruising radius of from two thousand to four thousand miles, with an engine horse-power of nine hundred to two thousand four hundred, and with a surface speed of at least 12 knots per hour, if not much greater. It is also claimed that they can travel entirely submerged for distances of more than one hundred miles without showing anything but the periscopes and that this can be done at a speed of not less than 10 knots. One description of these new boats reads as follows:

> "The special characteristics of these new submersibles are their extraordinary dimensions and the strange appearance of their bows. The latter are in the form of a sword blade, with its point protruding from the water. By means of a construction altogether original, the blade is excessively hard and firm, so that when the submarine moves with moderate velocity, it can penetrate steel plates to a depth of 40 millimeters, and cuts them like a knife. These boats are constructed and provisioned for 70 days, and, if necessary for a longer period."

If this description is correct, these boats will prove truly formidable adversaries; it is presumed, however, that the sword blade form mentioned refers to razor bows or other means of cutting through steel nets.

There is every indication that in the last few months Germany has developed and put into commission probably sixty of the new mine laying type of submarines. These have a radius of one thousand to two thousand miles and can carry from a dozen to twenty mines each. One of this type captured by the English and brought into port is about one hundred and ten feet long, 10 feet beam, and draws about 10 feet when traveling on the surface. It is armed with one machine gun and carries 12 mines, but no torpedoes, as all space is required for mine storage.

The question arises as to what can be done to combat such formidable fighting machines at sea. The methods would naturally include mine sweepers by the score, the utilization of numbers of fast destroyers, quantities of submarines, naval hydroplanes and fast going motor boats with 1-pounder, 3-pounder and 6-pounder guns. The greatest success had probably attended the use of steel nets that have proved in nearly every case fatal to the boat and its crew, once entangled in their meshes.

The fighting during the past week or ten days on all the land fronts has been almost at a minimum, due to the exceptionally cold and stormy weather. On the Riga front the Russians under Gen Dmitrieff, the Bulgarian hero, serving now in Russia, have been fighting in the swamps along the River Aa with some decided advantages claimed by them.

Along the left flank of the long front occupied by Gen. Brussiloff's armies there have been fighting centers on the boundaries of Bukowina, Rumania and Hungary. Here the Russians have driven the Germans out of their trenches, capturing guns and prisoners. It is probably that along this part of their line, the Russians will make their supreme efforts when spring comes, because if the German lines can be pierced and the Carpathians crossed into Hungary, the rear of the Central Allies' lines along the Sereth River and through Rumania will be threatened, and much of their 1916 successes voided.

**The train of trucks which accompanies a 400 m.m. gun when it is in service at the front. The gun may be seen in the background**

In Macedonia there have been small engagements in various places in front of Monastir, in the Vardar Valley and even as far east as Seres. When the cold of winter has mitigated and the snows in the Macedonian Mountains have disappeared, the Entente Allies will probably undertake to advance from Monastir up the Vardar Valley to Usküb and thence to Nish, while the strength of the Eastern column may be such as to allow an advance along the Struma to Kustendil and thence to Sofia. It is more than probable that the resistance to be expected will not be so great as heretofore, due to the undoubted withdrawal of many German troops from this front and from the Rumanian lines along the Sereth for use in France and further north on the western Russian borders.

The Somme battle has been renewed, the British have occupied the village of Grandcourt as a result of the recent fighting and have captured the Sailly Sallisel Hill. This last is a commanding position and will permit of further extensions in the campaign to surround Peronne. It is evident that great pressure on the part of the Entente Allies will soon be brought to bear along the whole of this front, for it would seem that here the great spring advance, for which so many preparations have been made, will be begun. The Allies, in addition to other drawbacks, were stopped here in their fall advance by the heavy rain storms that converted the entire country into a lake, effectually checking all operations. This year no time will be lost, as apparently the movements now in progress and other significant events of the past few days indicate that the great drive is at hand.

Already the Allies have established their superiority over the Germans in both men and munitions, and the supplies are daily increasing. The German fighting powers would appear to be waning. Their lines are thinly held, they are very frequently surprised in trench raids and attacks, and their positions are more easily taken. Their lines from the North Sea almost throughout all France are in a zigzag, requiring more men and guns than would be necessary if all the salients were straightened and new lines occupied. With their usual care and foresight this has no doubt been foreseen. Even if driven out of their present trenches, there is now probably ready a new line more in accord with military principles thoroughly prepared somewhere in the rear, probably as far back as Lille, Maubeuge, Méziéres and extending to the Verdun front.

*(Concluded on page 209)*

# Correspondence

*(The editors are not responsible for statements made in the correspondence column. Anonymous communications connot be considered, but the names of correspondents will be withheld when so desired.)*

## Patents in Escrow

To the Editor of the SCIENTIFIC AMERICAN:

At a time when so much attention is being given to the promotion of American trade abroad, it would seem timely to make a certain alteration in our patent laws, which I believe would do much toward promoting our foreign interests.

Under present procedure, when an American inventor is granted a domestic patent, the publication of that patent in the *Official Gazette* destroys the possibility of his procuring foreign patents. Thus unless an American inventor applies for foreign patents before his American patent is issued, he cannot obtain foreign patents at all. This works a great hardship on American inventors and thousands of patents which might be taken out abroad are lost

In order to obtain funds for foreign application, if, as is usually the case, the American inventor cannot himself afford the expense, he must peddle his invention about among backers before he has his American patent. This is a hazardous process since any one who might think he wished to invest in foreign patents, upon having the invention disclosed to him could apply for foreign patents in his own name, and even jeopardize the American application by interferences. Furthermore, in endeavoring to raise capital, the American inventor without an actual patent in hand, but with only a patent-applied-for and at most an allowance, has nothing substantial to offer the investor.

I would suggest that, when a patent is granted by the Patent Office, the inventor have the privilege of placing it in escrow, prior to publication, in the hands of the Commissioner, for one year; and that arrangements be made with foreign countries that such patents in escrow be regarded as unpublished and that no one save the American inventor be allowed such a patent.

The American inventor, with a patent actually granted and not liable to be jeopardized by interferences at home, would have a year's time in which to obtain the necessary capital to make foreign applications. Such an arrangement would greatly promote American interests abroad and would result in large returns to American inventors which are now lost, as it is very difficult to obtain capital to finance foreign patents before the American patents are even granted.

There could be no objection to such a plan that I can see except that the state of the art would remain unpublished for one year, and an occasional second inventor would make an application, which he might be saved making had the publication been made. But the fees in such a case are only $15 and even if an invention were invented a second time before publication and while in escrow, by a hundred second inventors, their loss would be in fees only $1,500, which would be less than the value of the patent to the first inventor in even the smallest of foreign countries. It is unlikely, however, that there would be more than two or three second inventors, if that many, for each patent placed in escrow, and it certainly could not be argued that the first inventor be deprived of his foreign rights, which is to a great extent the effect of the present law, to save a possible second inventor the cost of an application which could not in any event benefit him.

The stimulus to invention would be very great if foreign patents were thus put within reach of American inventors. If it were not possible to make suitable arrangements with foreign countries, it would suffice to have the allowed application remain in the Commissioner's hands in escrow unsigned for one year, but not subject to interferences any further than an issued patent. The term of the patent, however, should begin to run when placed in escrow.

EDWIN HOPKINS.

New York.

[*Not only is it possible to file patent applications in most of the foreign countries during the year following the filing of the application in the United States, and irrespective of the issue of the United States patent, but it is also possible to have the issue of the United States patent delayed six months after the grant and before payment of the fee.*

*To go further and issue a patent which the public may infringe without giving the public any opportunity to examine the patent does not appear reasonable.*—THE EDITOR.]

## The Battle-Cruiser Controversy

To the Editor of the SCIENTIFIC AMERICAN:

During the last month a number of letters in regard to the proposed electric drive for our new ships have been published in various newspapers and periodicals. In every case that has come to my attention the disadvantages of electric drive as compared with geared drive have been given, but the advantages have been completely ignored. My object in writing this letter is to point out some of these advantages.

With geared drive only a single-ratio reduction between turbine and propeller can be obtained. This ratio is such that when the ship is at full speed the turbine is running at its most efficient speed. As a result when the ship is at cruising speed the turbine runs at a much lower speed and the efficiency is low. This is rectified in part by multi-staging, but at present no turbine has been developed that will give high efficiencies both at maximum and cruising speeds.

With electric drive the turbines always run at or near their most efficient speeds. At full speed *two* turbo-alternators supply *four* shaft motors. At cruising speed *one* turbo-alternator supplies *four* shaft motors. Thus high efficiencies are obtained at all powers. Another advantage of this system is, that breakdown of one turbine does not put the ship out of action.

Reversibility is necessary for all ships, but particularly so for warships. With geared drive this can only be obtained by the installation of separate reversing turbines on the shafts. These reversing turbines cause a further reduction in efficiency when going ahead, To keep this loss down they are made as small as possible with the result that the backing power is only a fraction of the ahead power.

All this is avoided in electric drive as the motors can rotate in either direction at the same speed and efficiency while producing the same power.

The time element in reversing is another important factor. With geared drive a number of large valves must be opened or closed. With electric drive it is only necessary to throw a few switches at a central station, while the turbines continue to rotate in the same direction.

Other advantages are great simplification and reduction of steam piping.

No racing in a seaway as the heavy rotor acts as a flywheel.

Ease and rapidity in handling as complete control is given at one central station. Starting, stopping, reversing and changing from full to cruising speed are all accomplished by throwing a few switches.

Except for the alternator slip rings carrying about 220 volts, there are no moving contacts. All leads carrying the heavy alternating current are stationary and completely insulated over their whole lengths. Thus the danger of short circuits or other electrical troubles is small.

In regard to the recent disablement of the Jupiter, I quote from Rear-Admiral R. S. Griffin's reply to Mr. S. S. Wheeler's statement to Senator Swanson, "In regard to the recent disablement of the 'Jupiter,' it should be stated that it was due to a small piece of an oil-strainer basket becoming detached and being carried with the oil to the thrust bearing causing heating of the thrust and necessitating stopping the turbine."

M. M. ALGER.

[*The question is more military than mechanical. The electric drive requires so much space that, in battle-cruisers, half the boilers have to be placed above the protective deck where they are exposed to shell fire.*—EDITOR.]

## A Correction

To the Editor of the SCIENTIFIC AMERICAN:

To eliminate a possible injustice to which my attention has been called, permit me to substitute the word "employees" for officials in describing the visit of the powder man who tested the French helmet or helmet stampings, described in your issue of January 13th. The remainder of the statement is correct. The Frankford Arsenal, not like all departments under the general control of our somewhat moss-backed War Department, is progressive and up to date, and responsible for turning out the highest grade of military ammunition produced by any arsenal in the world. I should hate to do its officers an injustice, even by the jocular reference of the powder man who tested out the helmet stampings.

Further investigation of the helmet story, which I wrote you sounded improbable from what we knew of steel and bullet penetration develops the fact, that essentially as told, it is correct, although instead of the finished helmet, stampings ready to be made up were used—and there is of course no guarantee as to the final purchasers, although the steel people gave the impression that they were the French. Photostat record of the tests has been sent on to the Chief of Ordnance of our army at his request.

EDWARD C. CROSSMAN.

Los Angeles, Cal.

## Our Country and Its Resources*

**By Arthur Powell**

AT last we have a big, dynamic book that shows the land we live in; under one cover is brought together just the essential knowledge that the live American has hitherto had to ransack many dry volumes to find, if he found it at all. Here Uncle Sam tells his own wonderful story in his own genial way, with the pen of high Government officials; no dullness mars his sparkling pages; it is very human and intimate, this story, much of it told in maps and pictures We are governed by means of invisible threads that seem to begin nowhere, but always end somewhere to our profit and often pleasure; here we trace these invisible threads to their source, and learn how they are spun. American achievement has set the pace for the world; five blades of grass grow where only two were found; forests are conserved at a profit; reclamation makes the desert smile; good roads decrease the cost of living; the Patent Office has made us a nation of inventors and has quadrupled our national wealth; commercial and industrial preparedness have changed the gears on the car of industrial progress; how all this has been and is being accomplished is lucidly told. The force behind this progress is a hundred million man-power; a most interesting chapter on population graphically presents the facts of the origin, distribution and employment of this huge force, admirable maps reducing much of the information to a few significant lines.

Another intellectual treat is a chapter by the Secretary of the Interior on our national resources and how they are being developed. In a personal letter to the Editor, President Wilson says he regards as "a signal service to our country" such effort as is here made to arouse it to a knowledge of the great opportunities open to efficient industry based upon scientific research, education of the worker, and a "broad vision in finance." The Hon. Franklin K. Lane's paper convincingly sustains the President's position, for it shows what the three elements of science, intelligent application and broad vision have already accomplished, at the same time pointing the way to further progress; every American should read this chapter, and also those on the recent development of our commerce, by Secretary of Commerce William C. Redfield, and commercial and industrial preparedness by Dr. Pratt, of the Department of Commerce; all are impressive, illuminating and vital contributions.

Here is the army, and our new navy, the material and personnel of which, are splendidly set before us in text and illustration. Uncle Sam has a tremendous amount of ready money—as anyone should have who makes his own—and the mysteries of the assay office, the mint and the treasury are revealed by men who actually direct the machinery of the money mills. Uncle Sam has an El Dorado in Alaska; he owns, too, numerous tropical islands, how he came to own these rich territories, what he is getting from them, and what he is doing for them, is also briefly narrated in the first part of the work.

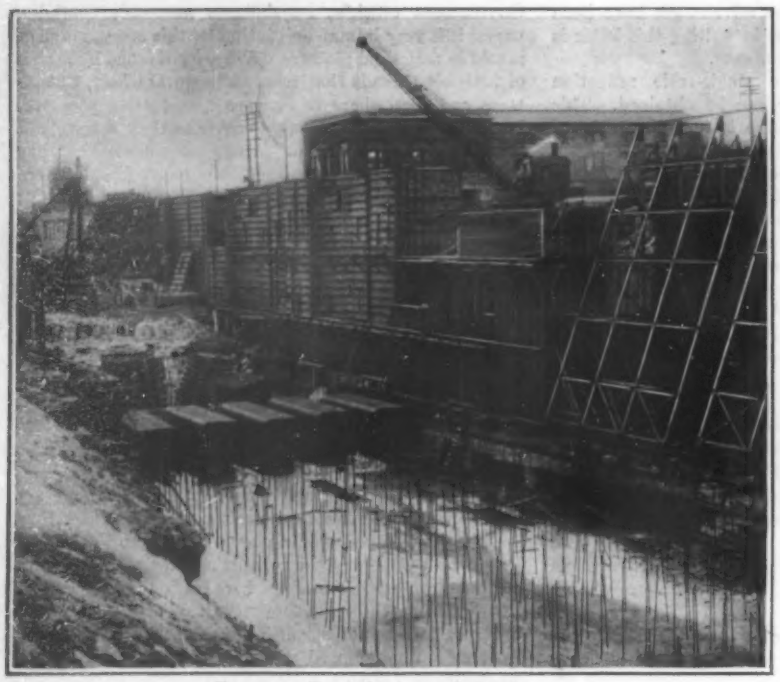
The second part deals with things of interest to every American citizen—the American flag; the marvels of aviation, and wireless, and motion pictures; all about the weather and the seasons; and the miracles of the heavens, with maps of the night sky throughout the year enabling constellations and the brighter stars to be located with ease. The third part of the work is devoted to Uncle Sam's autobiography; the man who assimilates the knowledge of national administration here imparted will increase his sense of power and usefulness and will better his standing in any community; he will be able to answer all questions as to the functions and powers of the President, the Cabinet, and the various Departments, for exact statements, written or revised by the officials themselves, cover every activity of the Government and define the duties of each Bureau; thus the volume is given an authority that makes it practically a semi-official guide to Government activities.

The entire volume is a noteworthy contribution to the literature of true preparedness. If it is man's first duty to know himself, his second duty is to know his country; the attitude of mind that craves this knowledge is the attitude of mind that assures our progress in peace and our defense against irretrievable disaster in war. Mr. Hopkins' latest work at once creates and satisfies a thirst for this knowledge, and much of the enthusiasm that must have sustained him through the enormous labor of the undertaking is imparted to the reader in the form of a sane, intelligent patriotism that, knowing what has been done and what remains to be done, is willing to take its not unimportant individual part.

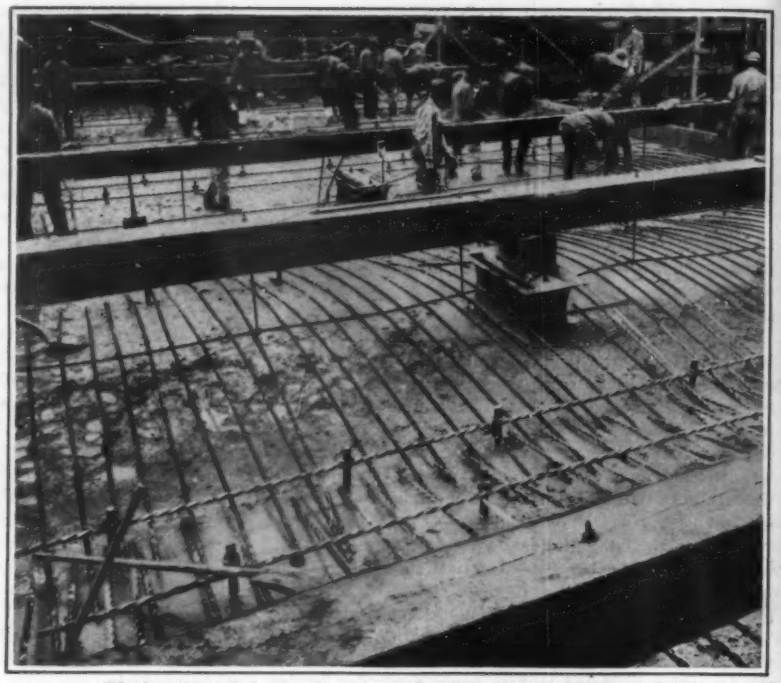
This book has received numerous letters of appreciation from those high in the Government Service, but, perhaps, no one has struck the keynote any more accurately than one of the officials of the Bureau of Mines, who writes as follows:

"To my mind it contains a mass of accurate information concerning this country which cannot be found within the space of any other volume, and the best of it is that it is up to date. Anyone who is at all interested in his own country can gain a wonderful fund of knowledge by reading this book. I only wish that the book could be placed in the hands of every boy and girl of the country entering high school. A thorough knowledge of what this volume contains would enable all of them to sing with a greater intelligence and deeper patriotism, 'My Country 'Tis of Thee.'"

*OUR COUNTRY AND ITS RESOURCES. By Albert A. Hopkins, Member of the American Statistical Association, Editor of the Scientific American Reference Book, etc. New York: Munn & Co., Inc., 1917. 8 vo., 508 pp.; 800 illustrations. Price, $2.50.



Frames and reinforcing rods in place



Placing the reinforcing bars in roof of first section filling culvert

# Completing the World's Busiest Waterway

## The Fourth Lock at Sault Ste. Marie

By Herbert T. Wade

NO surer index of the growth of internal commerce in the United States can be found than the statistics of the use of the ship canals and locks at Sault Ste Marie, Mich. and Ontario, and the continual provision for needed additions to their facilities. The excavation of new canals and the building of new locks has involved engineering and constructive skill of high order, and it was in no small measure due to the experience of the United States army engineers at the Saint Mary's Fall Canal that they were enabled to design so successfully the massive locks and gates at Panama. On the American side of the Saint Mary's River there are now three important locks in operation, and there is in process of construction, at an estimated cost of $3,275,000, a fourth lock, as shown in our illustrations. This reproduces in size and essential features the Third Lock opened to navigation in 1914 and since that time used with complete success.

These canals, together with one on the Canadian side of the river, provide for water-borne traffic around about three-fourths of a mile of rapids, and while their length is not great, nor is there more than a single lift required to overcome a difference of level which ranges from seventeen to twenty-one feet, yet the locks as regards size and methods of operation are arranged to take care of a volume of traffic much greater than that which normally goes through the Suez Canal. At Sault Ste. Marie must pass all the Great Lakes shipping to and from the Northwest. There are locks of great size and massiveness, exceeding in length, in the case of the Third and Fourth Locks of the American canal, the locks at Panama and those now under construction for the enlarged Welland Canal in Canada, and so arranged as regards their approaches, gates, culverts and pumping plants, that there is a minimum of time spent in lockage.

With the provision of a number of usable locks and a sureness of operation, interruption of traffic due to accident is well guarded against. In a time of industrial activity the holding over of cargoes of ore, coal or grain would be attended by serious consequences. Similar considerations and experience led to the building in duplicate of the locks at Panama.

The great length of the Third and Fourth Locks at Sault Ste. Marie, 1,350 feet, as compared with 1,000 feet at Panama, of course, is not for the present or future accommodation of superdreadnoughts or such transatlantic liners as the "Aquitania," for the maximum length of the lake freighter is only about 650 feet and the largest passenger steamers not over 500 feet, but it is to enable two or more steamers to pass through the lock together, as many as five boats together frequently being included in a single lockage. The number of vessel passages in a single day may run as high as 125, as was the case on November 14th, 1915, when the freight traffic reached a maximum of 624,916 tons and the aggregate registered tonnage 386,706.

For a single steamer the time of passing through a lock has been as little as 10 minutes for the Weitzel Lock or 15 minutes for the Third Lock, though under ordinary circumstances from 20 minutes to an hour is spent in the lock, the average in 1915 being 31 minutes 19 seconds, while from one to three hours are consumed in passing through the 1¾ miles of canal including lockage. Inasmuch as the canals and locks in 1915 showed a total freight traffic of 71,290,304 short tons valued at $882,263,141 on which freight charges amounting to $41,984,030.83 were paid, it will be seen how vital adequate facilities such as will be provided by the new Fourth lock must be considered to be. In 1916 the freight amounted to 91,888,219 tons.

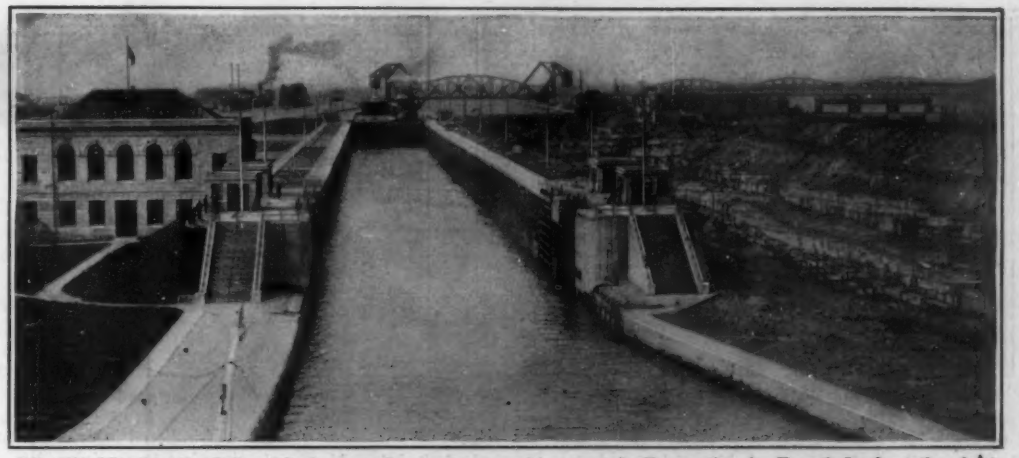
General view of excavation for Fourth Lock at Sault Ste. Marie

Referring to the map it will be seen that on the United States side of the rapids there are three lock systems in operation and one, the Fourth Lock, under construction. The oldest of the American locks, the Weitzel Lock, dates from 1881 when it was completed by the United States government as an essential improvement of the small ship canal built by the State of Michigan in 1855. The Weitzel Lock is 515 feet long, 80 feet wide, and has a depth on the miter sills of 17 feet, being arranged for an average lift of 18 feet. Next came the Poe Lock named, as was the Weitzel Lock, after a distinguished United States army engineer officer in charge of various improvements in this district, and completed in 1896. It has a chamber 800 feet long by 100 feet wide with 21 feet of water on the sill at mean stage of water. The greater width was provided so that two vessels could be locked though side by side, but this was not found desirable and the lesser width and greater length for tandem lockage was adopted for the Third and Fourth Locks, which afford satisfactory accommodation for everything except the widest passenger boats, which use the Poe lock.

Of course the construction of new locks meant the extension and deepening of the approach channels, but even then the facilities were not adequate and in 1907 a new lock and separate canal was provided for in the River and Harbor Act. This enabled the Third Lock to be constructed at a total cost for the lock alone of $2,200,000. It was a concrete structure built in monolithic masses 30 feet long, and 1,350 feet between gates, affording a usuable length of 1,300 feet, a width of 80 feet and a minimum depth of 24.5 feet below extreme low water. This increased depth brought back to the American Canal, though on neither it nor the Canadian Canal was there a charge for tolls, the largest sized bulk freighters which had used the latter, completed in 1895 with a lock 900 feet long and 22 feet of water on miter sill for its slight advantage in depth over the Poe Lock. The actual draft passing through the canals is, however, limited, not by their depth, but rather by the minimum of water, about 19 feet, on certain shoals above the falls.

The Third Lock project also provided for the construction of a new and independent canal 260 to 300 feet wide, shown on the map as the North Canal, and this was planned to afford an approach also to the Fourth Lock, which, with the same dimensions as the Third Lock, was authorized by Congress in the River and Harbor Act of 1912. This new canal has a depth of 25 feet. The Fourth Lock lies alongside of the Third Lock and the same pumping plant electrically operated will be used for both, the older locks being hydraulically controlled. The electricity is generated at a power plant at the falls and the pumps are so powerful that any of the locks can be filled or emptied in 9 minutes and the lock gates opened in 1½ minutes. Soon after the appropriation was made work on the excavation of the

Fourth Lock was commenced, steam shovels being used to remove the lighter and overlying material, and blasting to break up the solid rock on which the structure was founded. The excavation for the lock pit was completed by the spring of 1915 and in June of that year the contract was let for the masonry, the work having proceeded with such vigor since that by January, 1917, the masonry work was half completed, though no work had been done on gates or machinery.



The Third Lock at Sault Ste. Marie, seen from an approaching vessel. Excavation for Fourth Lock at the right

After the excavation to the level for the culverts below the floor of the lock, these were duly built of reinforced concrete and the anchor rods were set. For the culverts wooden forms were employed while for the vertical walls of the lock chamber steel forms were used, both types of construction being shown in the illustrations. There are both filling and discharge culverts under the floor of the lock with numerous port openings, and these are built around timber forms designed to afford strength and massiveness. The walls of the lock chamber rise to a height of about 50 feet and vary in thickness from 12 feet at the top to 26 feet at the bottom. In chambers also are placed the butterfly valves that control the admission of water to the culverts and there is a drainage tunnel between the Third and Fourth Locks. For pumping and the operation of the locks there is a hydro-electric power plant which makes use of the fall at the rapids, and in connection with this there are compensating works with Stoney sluice gates just above the International Bridge, a bascule structure crossing the canal and rapids, and shown in the background of several of the illustrations.

Any one of the locks may be pumped out by any single pumping plant and there are electric winding engines to open the locks and electric capstans available to assist in maneuvering the vessels through the locks. The gates of standard size are of steel for the service gates, and of timber for the guard gates, both of the double leaf pattern and both used for each lockage, there being no emergency dam provided for the Third or Fourth locks as was the earlier practice. The steel gates are 45 feet 6 1/8 inches wide for each leaf.

While the new Fourth Lock merely reproduces the engineering features of the Third Lock and is identical in size, yet it is an important work and will add much needed facilities at the "Soo." As other work here, it reflects the United States River and Harbor Improvement at its best, whether considered from an economic and commercial standpoint or as an engineering project.

Here there is no evidence or suspicion of "pork," the taking care only of local interests, or starting something that shows no promise of future usefulness, but a large national improvement where many of its features often have been executed well within the estimates. The completion of the American canals at Sault Ste. Marie will afford adequate facilities to this great artery of the Great Lakes, where the vast ore traffic from the Northwest alone is a matter of national concern.

## Cuban Markets for Our Electrical Goods

CUBA'S present day electrical needs are described thoroughly and graphically in a report now being distributed by the Department of Commerce. This document, prepared by a special agent of the Department who is at once a competent electrical engineer and an electrical goods exporter of long experience, is the first of a series which should find its way into the hands of every man in the country who is interested in the sale of electrical goods to foreign markets.

As some indication of the scope of this pamphlet, we quote the list of its chapter headings. Central stations, lighting, heating devices, miscellaneous applications, power for sugar mills, possible future fields, customs classifications, statistics of imports, packing, trade-mark registration, advertising, list of dealers and users, are the topics treated. The report will be forwarded to any address upon receipt of five cents (not in postage stamps) by the Bureau of Foreign and Domestic Commerce. Applications should mention it by the number—Special Agents' Series No 128.

## The Largest Casting for the Largest Battleship

THE mainstay, the part which forms the starting point in the building of all large superdreadnoughts, battleships and merchant ships is what is known as the stern frame. One of the largest ever made is shown in the illustration. It is the stern frame or stern post for the United States superdreadnought "Pennsylvania," put into commission last summer. One just like it forms the backbone of the "Arizona," recently accepted by the government. It constitutes the main framework of the stern of the ship and the rudder is attached to it.

To-day such large pieces are made of cast steel and are very difficult to produce. This particular one was made in two pieces or sections. Some equally large are made in one. They are molded in sand from wooden patterns, the sand being contained in large steel flasks. After the mold is completed and the pattern withdrawn, it is baked or dried in a large oven. The complete mold itself is in sections, too. When put together after drying and made tight, very hot molten steel, as thin as water, is poured into the mold. When this has cooled completely, the mold is knocked apart and the casting is ready for cleaning and cutting off the excess metal. It is then carefully annealed This means that it is heated to a high temperature—until a cherry red all through—in a closed furnace, fired by gas or soft coal. In this it is again allowed to cool slowly; the process removes or neutralizes nearly all defects and strains in the steel.

The molding and pouring of such a casting takes nearly two months. This particular one weighed when in the condition shown in the illustration 59,826 pounds, the larger piece accounting for 37,990 pounds Its length is nearly thirty-five feet.

Nearly all such castings are made in one district in the United States—at Chester, Pa, near Philadelphia. In steel foundries there, all the large steel castings for government battleships and cruisers have been made for the last 30 years—ever since cast steel replaced wrought iron in their construction. Similar work for foreign navies has also been done there.

## Destruction of Rats on Vessels

THE last annual report of the Public Health Service discusses somewhat fully the various methods of fumigation employed for destroying rats on vessels and the advantages derived from such destruction. The service strongly favors the use of cyanide gas as a fumigant, notwithstanding its admitted danger to human life when due precautions are not taken. Workers in cyanide gas fumigation are generally very careful when initiating this method, but as they become more proficient and fumigation proceeds without any mishap carelessness takes the place of caution, and sooner or later a fumigator is apt to be temporarily overcome. At new Orleans during the last fiscal year 426 vessels were fumigated with cyanide gas with no fatalities, but in two cases men were overcome as a result of not waiting the prescribed time after fumigation before entering compartments. The rule at New Orleans has been to wait 15 minutes after opening doors of superstructures and one hour after opening holds, before permitting anyone to enter. Hitherto natural ventilation has been relied upon to dissipate the cyanide fumes, but during the coming year it is planned to use some form of blower, operated by a gasoline engine or motor, for the purpose of dispelling the gas. Captive animals will probably also be used in testing the air. The necessity of great caution is shown by the fact that persons in one compartment of a ship have at times been killed by the fumes escaping from other compartments undergoing fumigation. The periodical fumigation of vessels is valuable not only as a sanitary precaution, but also as a means of protecting the cargo from the depredations of rats. A case is mentioned in which 30,000 sacks of coffee were damaged by these rodents during a voyage from South America to New Orleans.

The stern piece and rudder post for the battleship "Pennsylvania." Although made in two pieces, it still ranks among the very largest steel castings

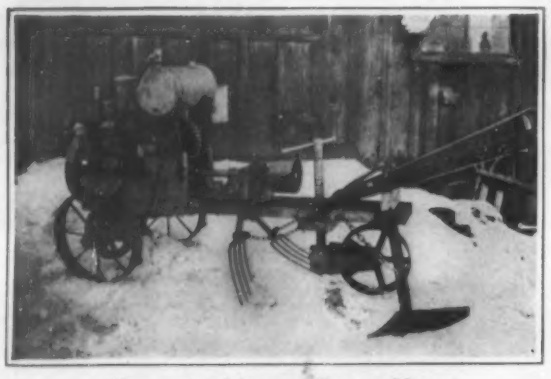
## A Spading Machine of Wheelbarrow Type

A CERTAIN hard-headed New Jersey farmer recently reflected that the ladies of his establishment had electric washing machines and electric sewing machines, but that he was still doing his spading by hand- and foot-power. He set his wits forthwith to work to remedy this state of affairs, and the little machine that we picture on this page was the result.

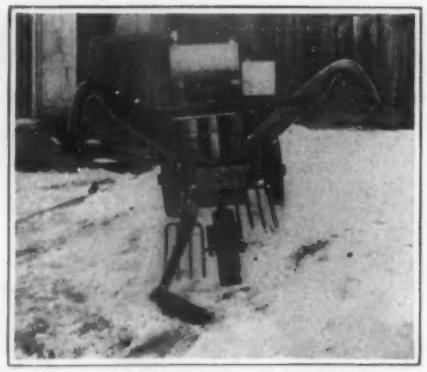
This device is especially designed for the small farm in sections where labor is hard to get. Large tractors are of course out of the question for such small work, and even the existing pony tractors are too heavy for light garden use; but this new machine is built so light that the operator may handle it like a wheelbarrow, if need be

There are two spading forks, arranged to work alternately, and two sets of springs, both connected to the shanks of the spading forks, one set above and one below the pivot In this way they counterbalance each other. The springs are adjustable so that the spades may yield individually one way or the other when meeting a hard substance. Each fork is driven by a piston and controlled by a small internal combustion engine. The motor is eight horse-power and is carried on a truck body with plow handles for guiding and controlling.

The operator takes his place between these handles, and the motor does the rest. This machine should appeal strongly to the man who maintains a small garden for pleasure or profit, yet does not care to bother with a horse or expensive machinery, or cannot profitably use these.



New motor driven spading machine



Rear view of motor spader

## Motor Cycling in the Snow

ALTHOUGH it is possible, with a little snow on the ground, to run a motor-cycle with its rubber tires, it has been found impossible to do so when the fall measures several inches. A resident of Galt, Ontario, has solved the problem thus presented.

The rubber tires were taken off the front wheel of the machine and the wheel of the side-car, and runners were fitted on and bolted to the rims of these wheels. The rubber tire remains on the rear wheel of the machine, for driving purposes; the runner on the front wheel makes a rut, in which this driving wheel secures sufficient traction to propel the machine.

A motor-cycle with runners of this nature, is entirely new, and makes this sport possible, even in the northern winters. The device has been given a thorough test, going through one foot of snow without any trouble at all.

A sleigh motor-cycle from Canada

## The Current Supplement

AN article on *A New Method of Studying Ideational and Allied Forms of Behavior in Man and Other Animals* in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2147, for February 24th, briefly sketches some experiments in comparative psychology in a direction that is attracting the attention of a number of investigators. *Lightning* is a valuable paper that discusses problems of the insulation of electric transmission lines and of insulators and describes apparatus for the investigation of various conditions. It is illustrated by a number of photographs of apparatus and explanatory diagrams. *The Pyrogenesis of Hydrocarbons* is an interesting review of various methods that have been proposed for the manufacture of petroleum products. *Fires in the Oil Fields* is an illustrated article dealing with the conflagrations of oil and gas wells, and of great storage tanks that so frequently occur, and the peculiar problems involved in their control and extinction. *Trenching Machinery* describes and illustrates some power operated machines that facilitate the work of the contractor. *Cocoanut Toddy in Ceylon* gives a great deal of information about the juice of the cocoanut palm, its characteristics, production and the uses to which it is put. *Illusions of the Upper Air* is a valuable review of progress in meteorological theory in England since 1866, by one of England's most noted scientists in this branch. It is illustrated by several diagrams. *Fraud and Skin Eruption* describes a number of odd cases of self-inflicted injuries that will interest others besides the medical fraternity.

## Linoleum and Imitation Leather

THERE is a great difference between oilcloth and linoleum. Ordinary oilcloth is a coarse jute canvas, painted over a number of times on both sides with a low-grade paint and a finishing application of a printed paint design on one side followed by a light coating of varnish to the wearing surface.

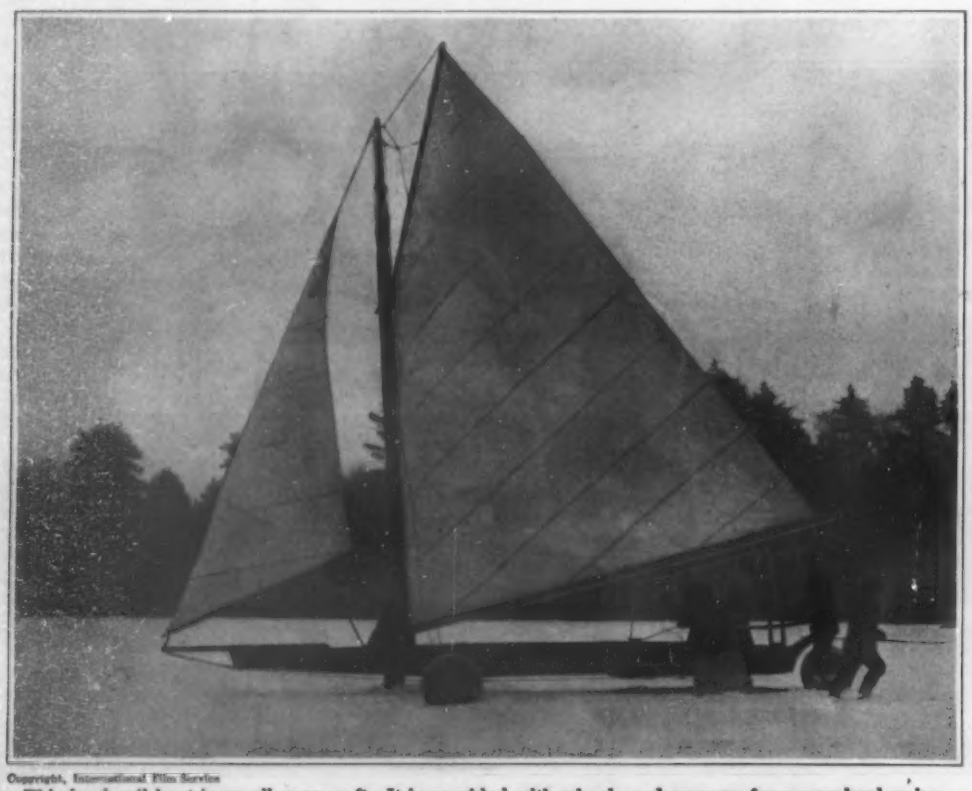
Linoleum is an entirely different thing, and Mr. Armand de Wiele of Staines, England, gives in the January number of the *Journal of Industrial and Engineering Chemistry* of the American Chemical Society the chemical philosophy of it. In 1864 Frederick Walton discovered that linseed oil, if treated with certain driers and heated, and treated with air under given conditions, becomes jelly-like, and that this product with rosin and gum kauri, on further oxidation by a second process, hardens into a tough substance like leather. The cloth holds linoleum together, but it is this leather-like thick covering that gives it its wearing qualities.

## A Sail Boat That Sails on Land or Ice

A LAND sail boat that can be used on either land or ice and which is said to be the first of its kind in this country, has been recently built by a leading aeroplane constructor of Marblehead, Mass., to the order of Vincent Astor.

The land sail boat, which appears in the accompanying illustrations, is to be sent to Palm Beach, Florida, for Mr. Astor's use on the beach at that resort. It will be noted that the craft follows the lines of the conventional ice boat and is fitted with three pneumatic tired wheels for land travel; in fact, the boat is so arranged that a set of skates may be adjusted to the tires and used on the ice when its skipper seeks recreation in colder climes.

Some years ago land yachting was a leading sport at several seaside resorts in France and Belgium, and it is not unlikely that the present land yacht is but a forerunner of this form of sport in America.



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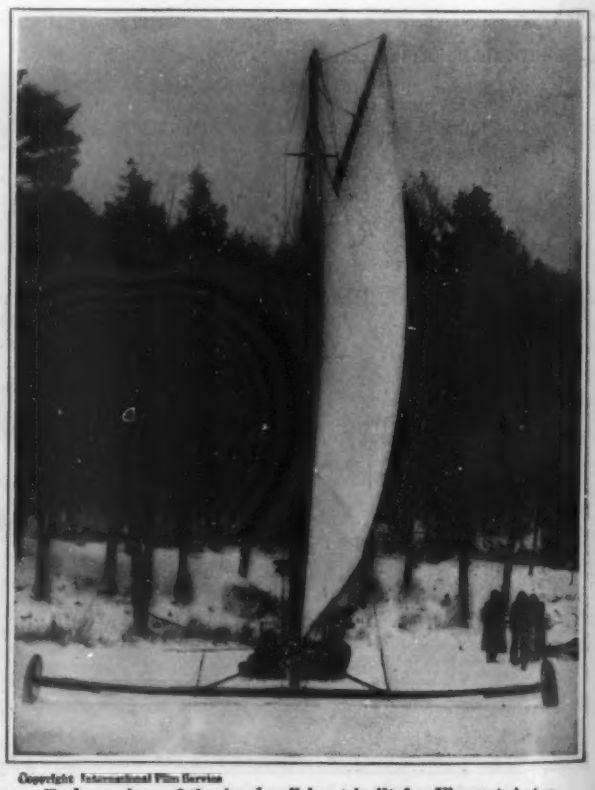
This land sail boat is an all-year craft: It is provided with wheels and runners, for use on land or ice



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End-on view of the land sail boat built for Vincent Astor,

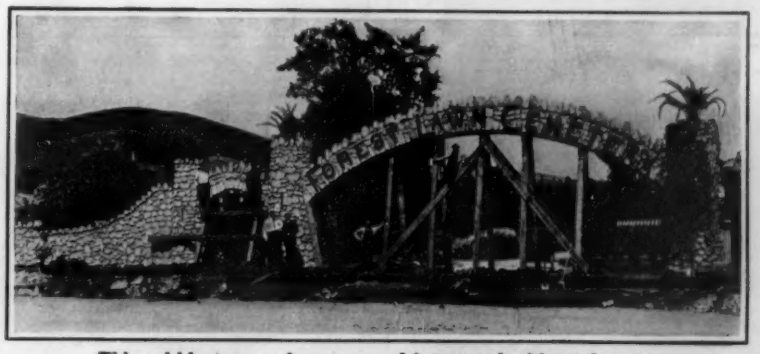
## Moving a Cobblestone Arch

A CHANGE in the line of the street necessitated the moving of a large cobblestone arch marking the entrance to Forest Lawn Cemetery at Tropico, Cal. The arch is not reinforced and measures 3 x 3 feet with a span of 38 feet and sidewalk arches measuring 7 feet. This structure, which has a total length of 105 feet, had to be moved 6 feet to conform with the new street arrangement.

Instead of tearing down and rebuilding, a house moving company of Los Angeles made a contract to place the arch in the new position in less time and for less money than it would take to do it the other way.

It took much ingenuity on the part of the movers, for the arch was not reinforced and therefore more easily cracked. Two 20 x 20 timbers were used to form the base support and the weight of the piers was transferred to them by steel needles of I-beams and rails. The main arch was carried by A-frames resting on the base timbers and further supported by two 24-foot lengths of plank laid against the intrados. When all was ready the base timbers were jacked up to take the moving apparatus beneath.

The cost of moving was $650, about half the estimate for tearing down and re-building. Not a crack was found in the masonry when the structure was set in place.



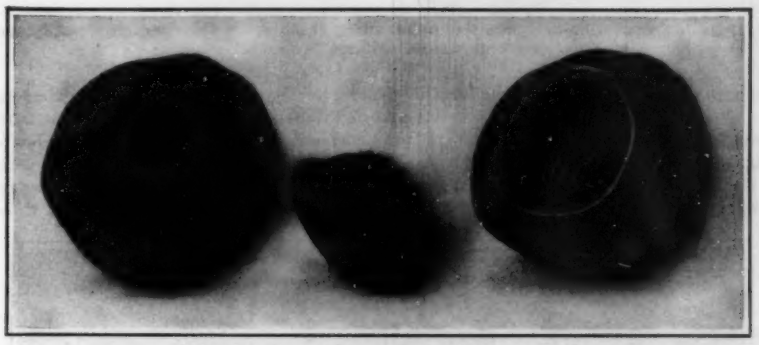
This cobblestone arch was moved intact and without damage

## A Natural Gourd With a Natural Lid

THE nut of paradise, which we illustrate, is so called by the natives of the upper reaches of the Amazon in reference to the heaven-like tranquility of the regions where it is found. Difficulties of transportation make it little known to the outside world, and unfortunately, for it is a worthy morsel indeed.

The nuts grow in gourd-like pods holding a score or two kernels each. These pods dangle inverted from the branches. On the under side there is a close fitting plug which, originally an integral part of the shell, is forced out by the nuts within as they swell to maturity. There finally ensues an explosion much like that familiar to every country boy through the behavior of witch-hazel, which tumbles "lid" and nuts to the ground together. Here the nuts either decay or go to feed the monkeys, or occasionally are harvested by one of the rare nut-gatherers for the bazars of Amazon towns like Ikiki and Ikitos.

This strange nut, so far as we know, affords the only instance in nature of a gourd that grows its own lid. The natives take advantage of this peculiarity in gathering the paradise nut, recovering the discarded plug, restoring it to its place over a shell filled with nuts and fixing it there with a turn or two of wire round the entire package.



The nut of paradise, with the lid on and off

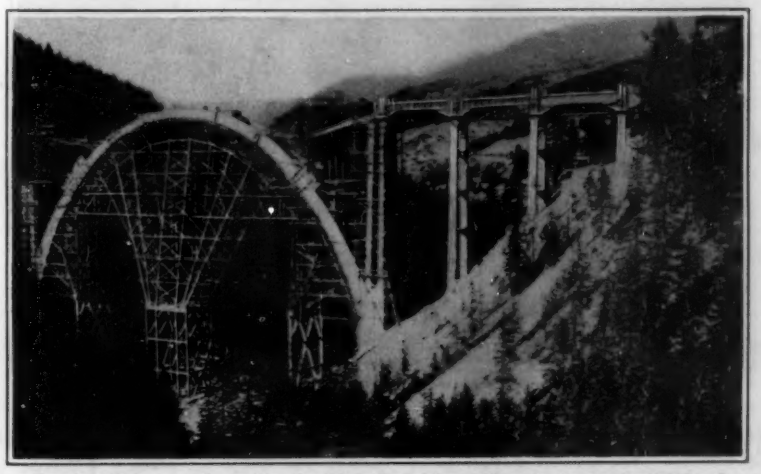
## Foot-and-Mouth Disease in Switzerland

A CONSULAR report states that foot-and-mouth disease which has raged among Swiss cattle for many years has been practically exterminated by methods similar to those recently followed in the United States. A federal veterinary bureau was established, to take over the work previously carried on in an ineffective way by the cantons, and the practice of slaughtering all infected cattle was put in operation, despite considerable opposition on the part of the stock raising interests. The principal slaughtering of such cattle was begun about the time of the outbreak of the European war, and as the meat was pronounced fit for food by Swiss experts much of it was fed to troops

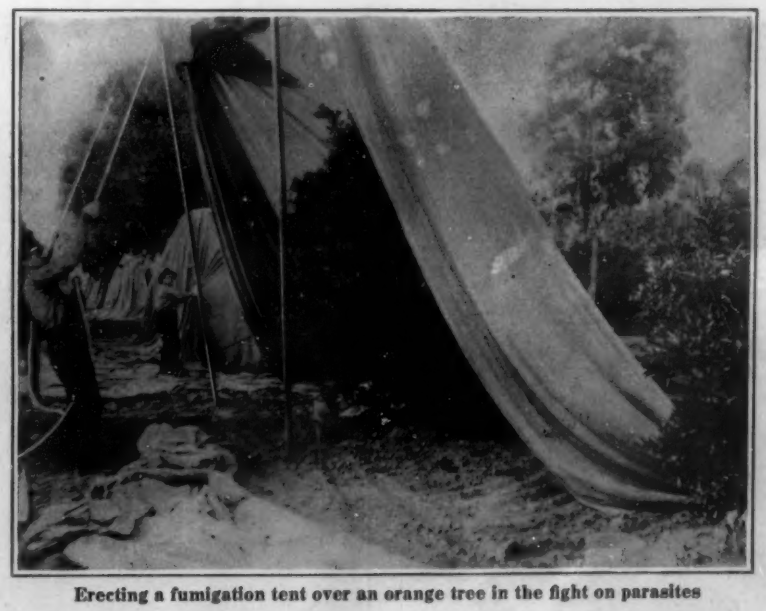
## Fumigation of Orange Trees in Southern California

ORANGE growers of southern California frequently resort to fumigation in ridding their orchards of parasitical agents which cause the destruction or partial destruction of the orange trees, with consequent heavy losses to the growers.

The usual method employed by the California orange growers consists of the erection of tree tents and the use of fumigator burners. As will be noted in the accompanying illustration, a rather ingenious procedure is followed in erecting the tree tents. The covering material is attached to the ends of two poles in the manner shown, and by means of ropes the poles are pulled up to the vertical position; and a further pulling results in bringing the cover well over the tree as the poles fall to the ground. The tree itself is then used to support the tent, under which is burned the fumigating material.



Constructing an arch on the electric railway from Chur to Arosa, Switzerland



Erecting a fumigation tent over an orange tree in the fight on parasites

## A New Invention Which Simplifies Trawling Work

AN invention which will be of interest to fishermen was patented recently in Canada by a Yarmouth resident. It presents a new method of setting trawls, and it is said that a United States patent will be sought.

A metal apparatus, consisting of a hook holder, a flat plate, and a cover or hood, is attached to an ordinary trawl tub. The hook holder and flat plate are placed in the tub, parallel to each other, dividing it into three compartments. The first compartment is for the trawl line, the second for the hooks, and the third for ice and salt. The hook holder is made of narrow strips of metal, so placed as to form a series of vertical slots. The flat metal plate separates the hooks from the ice and salt. On top of the tub is the hood, which has guide bars at each side.

Before the fishing starts, the hooks are baited and dropped down these slots, so that there is no danger of their getting caught in the line. When the trawl line is thrown overboard, it pays out automatically from the tub. The hook holder is made of aluminum and is riveted. The construction therefore is very cheap.

The advantages claimed for this invention are: (1) That the trawl can be set and automatically paid out from a boat without the hooks catching; (2) that is requires only one man to set the trawl, while under the old method one man had to pass the line overboard by hand and another rowed or sailed the boat; (3) the trawl line is kept clean as well as free from the hooks and gangings; (4) the ice preserves the bait, so that it is not necessary to rebait so often.

## Depression of the Ice Point of Thermometers

THE "depression of the ice point" is one of the defects to which the glass mercurial thermometer is subject. When such a thermometer is heated the glass expands to its final equilibrium condition corresponding to the higher temperature in the course of a few minutes, but when the instrument is again cooled to its former temperature the glass contracts very slowly, not regaining its original volume until after weeks or months. The result is a depression of the ice point engraved on the glass. The investigation of this phenomenon has recently been taken up by the Bureau of Standards. Different kinds of glass are being experimented with.

## Engineering Progress in Switzerland Despite the War

DESPITE the fact that Switzerland is surrounded by the fighting nations of Europe, and despite the fact that the little republic has found it necessary to mobilize her military forces in answer to the sinister massing of German troops along her northern frontier, Swiss engineers continue with their work as in times of peace.

An example of war-time engineering in Switzerland is presented in the construction of the electric railway from Chur to Arosa in the Canton of the Grisons. A feature of this undertaking is the gigantic viaduct near Langwies, which includes what is said to be the largest concrete arch yet undertaken in the republic. The skeleton framework for this arch is the subject of our present cover illustration.

## Pneumatic Stage Furniture That Collapses to Economize Space in Transport

FROM an impromptu affair held in the open with the natural setting for the scenery and a number of soldiers for the cast, the soldiers' theater has developed into a recognized institution. To-day the theaters in the war zone boast of real scenery, a real stage, and very often real players.

With characteristic Teuton thoroughness the Germans have not been slow in adopting the war theater idea and in developing the mechanical end of it. Their latest progress has been in the direction of special pneumatic stage furniture which, when inflated, takes on the forms of a table, piano, sofa, chairs, and so on, according to the requirements of the play. The pressure employed for inflating the furniture is sufficient to make it fairly rigid, so that the effect is highly realistic.

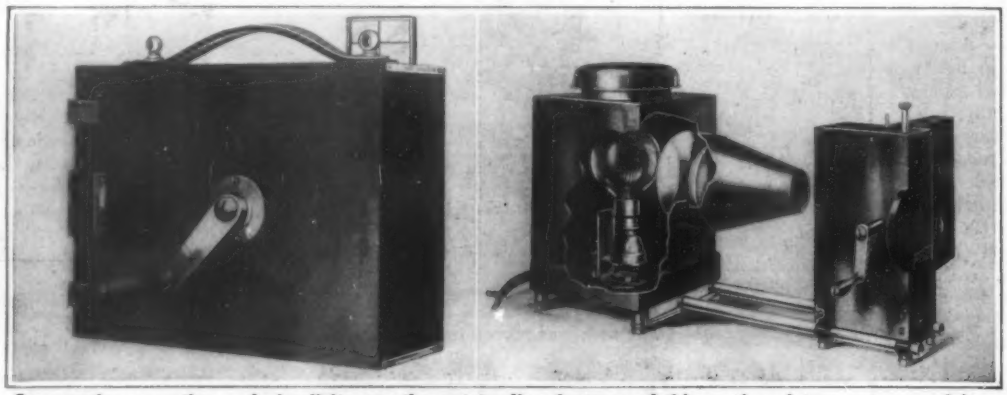
For transportation purposes the pneumatic stage furniture is deflated, whereupon it collapses and can be rolled up into a comparatively small bundle. To simplify matters each pneumatic "prop" or set is made in one piece, the carpet serving to join the various members together.

# Inventions New and Interesting

## A Department Devoted to Pioneer Work in the Arts

### A Motion-Picture Camera and a Projector for Home Use

MEASURING only 7 inches long, 5 inches high, and 2½ inches wide, and weighing about two pounds, a recently developed motion-picture camera is certainly justified in claiming compactness as one of its leading features; indeed, it is no larger than the average camera, and considerably smaller than the usual box-type cameras. Most important of all, however, is its simplicity; with a superficial knowledge of photography anyone can take motion pictures with this equipment.



Inexpensive operation and simplicity are the outstanding features of this motion-picture camera and its companion, a home projector

The present amateur motion-picture camera is simple because of the absence of the usual confusing adjustments; in fact, it is self-contained, nothing showing but the lens opening, the crank handle, and the direct-view finder Focusing, which is usually the leading source of confusion in professional cameras, is done away with in this camera. The lens is of the fixed-focus type so that the operator has only to find the object in the finder and to turn the crank to make perfect moving pictures

Another feature of the camera is the daylight-loading film container, which contains the unexposed film and the exposed film By means of a simple mechanism the film is taken out of the container or magazine, exposed, and then returned to the same container by the turning of a single shaft. The usual practice in motion-picture cameras is to employ two containers—one for the unexposed film and another for the exposed film. All the user of the new camera has to do when he receives the package of film from the dealer is to break the paper seal over the opening of the package, draw out the film far enough to form a loop six to eight inches long, twist the loop inside out, place the loop in the film mechanism of the camera, close the door, attach the crank handle and begin taking pictures.

The container holds 50 feet of film. The latter, being of a different size from the standard motion-picture film, is said to be equivalent to 100 feet of professional stock, or sufficient to record about two minutes' action. Furthermore, the small size of the film greatly reduces the cost of taking motion pictures, bringing it well within the realm of the amateur photographer.

A companion apparatus of the camera is a projector which measures 20 inches long, 9¼ inches high, and 8 inches wide. The necessary light is provided by a 700-candle-power gas-filled tungsten lamp which receives its power from the nearest electric light socket. Like the camera the projector is so simple that it may be operated by anyone, even a child. The projected pictures are from 18 inches in width up to 9 feet, depending upon the length of the room. At a distance of 12 or 15 feet a picture of unusual brilliancy is projected, four feet in width.

The new camera and the projector are designed primarily for the home, according to Frank L. Hough of Chicago, the inventor. They can be used by any man, woman, or child for the taking and projecting of home pictures, scenes of children, parties, games, home-made photoplays, and all the events of school and college life. They are admirably designed for class-room work and other educational purposes; they may be carried anywhere by the traveler, the autoist, the hunter, the fisherman, or the vacationist. It is also believed that they fill a long-felt need in the commercial field for the making of industrial films of manufacturing processes and of kindred subjects, in an inexpensive way. The projector can be readily carried about by the salesman, attached to any electric light circuit, and the pictures projected on the light-colored wall of the office of a prospective buyer.

It would appear from the foregoing description that the present motion-picture camera and projector place motion pictures on a par with roll-film photography as regards cost and simplicity.

### A Breathing Mask for Use in Manholes and Other Zones of Poisonous Gases

THERE lately has been developed a gas protector for use in manhole work and for other forms of labor that must be carried on in zones of poisonous gases or vapors, consisting of a mask, flexible tubing, intake funnel, and head straps This mask is especially intended for the workmen of gas companies, varnish factories, chemical plants, packing houses, breweries and other establishments where ammonia plants are in operation and ammonia gas is to be found.

The mask of the present gas protector is constructed of rubber and aluminum, and is held in place on the face of the wearer by means of adjustable head straps; an airtight fit is made by inflating the rim of the rubber mask through an air valve blown up by the mouth This protector weighs 7 ounces. The wearer secures his air supply through tubing connected with the intake of the protector. The tubing is so flexible that it can be tied all up into knots yet the natural air supply cannot be shut off, according to the claims of the designer; further, the tubing, being made with a spiral wound wire on the inside of the covering fabric, is practically indestructible. It is carried by a belt around the waist instead of by the head of wearer so that, if necessary, the mask is readily taken off without disturbing the tubing.

When the breathing is natural there is no pressure of any kind connected to the new equipment, pure air being drawn through the intake funnel and tubing to the mouth and nostrils and the vitiated air expelled through the exhaling valve in the ordinary process of respiration. Together with a pair of ordinary goggles for the protection of the eyes, the wearer of the breathing mask is equipped to enter into zones of poisonous gases or smoke without experiencing serious discomfort.

This workman is enabled to work in a gas-filled manhole because of the breathing mask and air line with which he is equipped

### A Recorder of Body Outlines

IN order to record the outlines of the human body in an accurate yet expeditious manner there has been devised at Wellesley College, Wellesley, Mass., an apparatus known as the thoracometer.

Briefly stated, the thoracometer consists of a pair of jointed, double parallelograms moving as units back and forth across the drawing board, and up and down by means of the sliding frame. Each parallelogram carries a rod, supporting at one end a pencil-holder and terminating at the other in a revolving button. The subject is placed on the platform so that the button of the recording arm may be passed directly down the spine, while the other follows the midline in front. Two operations are required, one for each arm. The tracings are made from the top downward, and with a little practice they can be made very easily, smoothly and quickly, the line followed by the buttons being reproduced upon the paper by the pencils held in the holders at the other end of the rods.

If only one tracing is taken on a sheet, only the name and date are needed for identification. If two or three are taken, it is desirable to cover each successive pencil line with a colored line, such as blue or red, to distinguish the different positions. To facilitate comparison of the tracings certain surface marks may be indicated on the paper, as the levels of the seventh cervical and fifth lumbar spinous processes, the

(Concluded on page 209)

The thoracometer, which records the outlines of a subject on a sheet of paper

Recording the outlines of a subject by means of the thoracometer

### When the Surgeon Sews

(*Continued from page 198*)

twisting the gut into a stout thread; and once the spinning is completed, the end from the wheel is transferred to another peg. When the operator has her frame full of these pegs, with the finished thread strung between them, she carries it away to the sulfuring stove and begins work on a new frame.

The threads remain exposed to the sulfur over night. The purpose of this treatment is to bleach the gut. They are then subjected for a while to the action of damp air, after which they are put through the spinning and sulfuring again. After several rounds of this, they are finally taken, completely spun and bleached, to the drying room. Here they are hung between wooden beams perforated to admit the pegs upon which the threads are still stretched. After several days of thorough drying they are polished by hand with sandpaper. There then remains nothing more to be done but to cut the threads to the desired lengths and wind them upon spools for the final sterilization. This is accomplished in several ways; in fact, experiments have been conducted upon five different modes of procedure.

Sterilization by contact of the cords with a solution of iodine is in some ways the most satisfactory. The spools are immersed in the liquid in glass tubes which have been purified of all foreign matter in a kiln. At the expiration of twenty-four hours, the iodine solution is drained off and replaced by a sterile solution of alcohol at 70, 80, or 90 degrees Centigrade, according to the degree of suppleness it is desired to have the gut display. The tube is then hermetically sealed, and remains so until used. The gut obtained by this process is colored and impregnated with iodine. It is necessary to use it immediately once it is unsealed; for it becomes soft after exposure to the air for a very short time. The process, however, requires only twenty-four hours, as against several days when the objection just raised is met by substituting eucalyptol for the iodine.

Another process of sterilization is Tyndallization. This has been recognized by the French army service as the superior method. It consists of a discontinuous heating in alcohol for five days. The spools, as before, are put in kiln-purified and sterilized tubes, but this time immersed in alcohol from the start, at a temperature of 90 degrees. After being hermetically sealed, the tubes are placed in a water bath which each day is heated to 60 degrees and held at that temperature for ten hours. Other processes for sterilization by means of heat and anhydrous liquids (alcohol chloroform, acetone), in place of the complete immersion of the spools in the sterilizing fluid, require only that a few drops of the latter be put upon a cotton stopper, which is placed in the mouth of the tube before sealing, and that a temperature of 120 degrees be then maintained for about an hour.

We must then conclude that the preparation of a catgut at once sterile and strong depends much more upon the gut-spinner than upon the means taken to assure the sterilization of the finished cord. If all the rules of bacteriological aseptics are followed, and every precaution taken against reinfection of the gut by contact in the course of the operations above described, a sterile gut is easily obtained by any one of the processes mentioned; whereas in the event of a cord infected in the slaughterhouse or during the process of gut-making, sterilization is very difficult, if not impossible. Indeed, the special committee designated by the Academie de Medecin to study the conditions under which catgut should be prepared in order to secure every surgical safeguard has recommended that ligaturing thread be manufactured only from fresh gut, and that the administration incorporated this provision in its specifications. In addition they demand that the methods of collecting the viscera in the abattoirs be revised, that in the gut-spinning establishments a special shop be given over to the manufacture of the surgical thread, and that in this work there be introduced the improvements

(*Concluded on page 209*)

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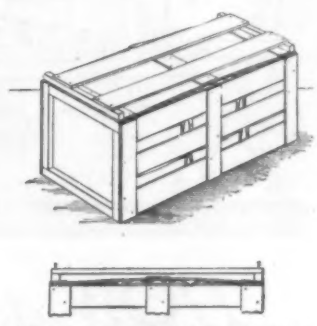
## RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

### Of Interest to Farmers

PROTECTIVE COVER FOR FRUIT CRATES.—S. P BUNKER, Rockville Center Long Island, N. Y This invention relates to a crate top for use in preventing the bruising of fruits and vegetables such as peaches tomatoes, and the like, by the piling of one crate on top of another or other heavy packages which cause the crate



PROTECTIVE COVER FOR FRUIT CRATES

covers of ordinary crates to be bowed down, thereby causing a heavy waste by the bruising and crushing of the contents. It also acts as a ventilator for car-lot shipping by giving an even distribution of cold air in refrigerator cars and also in storage of like products.

SHEAF HOIST.—E. EBERLY AND W. G. FETROW, Mechanicsburg, Pa. The invention relates to a sprocket pulley more particularly intended for use on sheaf hoists or any equivalent hoisting or conveying device in which a traveling chain having carrier fingers is caused to change its direction on the return run at an entrant angle formed by the movement of the chain in a vertical direction and laterly to and from the vertical direction.

SILO ROOF AND SEAL.—F. B. CRAWFORD, Atlanta, Mo. The invention has to deal particularly with a roof construction especially of that type in which the roof is made up of sector-shaped sections hingedly connected with the wall of the silo and adapted to be held in an open upright position so as to form an extension whereby the silage can be leveled to a greater height than the silo to provide for the settling of the silage to the level of the top of the silo, whereby no space is lost in the complete filling of the silo.

HARROW ATTACHMENT FOR GANG PLOWS.—J. SWAINSON, Foxwarren, Manitoba, Canada. This attachment may be attached to gang plows of various makes and be adjusted so that the harrow will follow in line behind the plowshare. The invention obtains the desired pressure at the harrow teeth by means of a spring, there being means to limit the downward movement of the toothed portion of the harrow relatively to the plowshare, so that the said toothed portion of the harrow may be raised with the plowshare.

BEET HARVESTER.—C J. HOBSON AND G. P WRIGHT, Orby, Cal. The machine tops, pulls and piles beets from two or more rows at a time. It loosens the roots from the earth, removes the beets from the earth to a suitable receptacle, deposits the beets on a line between two harvested rows, and deposits the plant tops on lines between the harvested and adjacent unharvested rows

CHICKEN ROOST.—C MICHAUD, Wantagh, L. I., N. Y. The invention refers more particularly to roosts of the folding type, whereby it can be folded, during daytime, close to the wall and out of the way. It provides a canvas or other bottom disposed under the roost bars for catching the droppings, such bottoms being readily detachable for the purpose of easy cleaning.

COTTON HARVESTER.—E. P. CAYO, Beeville, Tex. The invention provides a device which may aid the handpicking of cotton, so that the picker is enabled to do the picking with more comfort, with greater facility, and with less fatigue. The device delivers cotton which has been picked to a receptacle which is carried by the machine without the necessity of the pickers going to and from the receptacle

### Of General Interest

LAND TORPEDO.—V. A. VILLAR, 550 W 184th St., New York, N. Y., and STAFFORD C. TALBOT, London, England. The invention provides means which may be used either in an offensive or defensive manner but which are primarily designed for preparing a way along an impeded front for a charge by an offensive force upon an entrenched force, and which preparation is accomplished without casualties to the former. The device which explodes the charge is transported by vehicular means.

BAGGAGE CHECK PROTECTOR.—W. E. PULLARD, care of Mrs. W. Pullard, 3014 E. Baltimore St., Baltimore, Md. This invention refers generally to devices for attachments to trunks and other baggage, for the purpose of holding baggage checks thereon, particularly in lieu of the usual string or card fasteners for such checks, and provides a device attachable to a trunk for holding baggage checks in such manner as to prevent removal of the baggage check, without mutilation, and the substitution of another check therefor

### Hardware and Tools

RAZOR STROPPER.—R. TROSKY, 57 W. Houston St., New York, N Y The stropper has razor clamping means composed of a pair of bars which meet to clamp between them the blade, and in combination with one of the bars is a reversible holder which, when adjusted in one position is adapted to hold the Gillette type of blade and when reversed is adapted to hold the Gem type of blade

### Heating and Lighting

COCK.—A HEIN, No 12 Zimmerstrasse, Berlin, Germany. The invention relates more particularly to that class of cocks used for controlling the amount of heating medium admitted to a radiator, and provides a cock, which when adjusted to allow a certain amount of heating medium to enter the radiator, is prevented from being further opened by an unauthorized person.

### Household Utilities

BEDSTEAD CONSTRUCTION.—P. H. FRIEL, 421 Congress St., Kenosha, Wis. The invention relates to the construction of metal beds, particularly those made of metal tubes of relatively light weight, and provides means for connecting the tubes in the rigid manner, for either drawn or rolled tubes, which in the latter type of tubes, renders the tube itself rigid against torsional movement.

### Machines and Mechanical Devices

PRINTING MACHINERY.—C. POLLARD, 21 Berkhampstead Ave., Wembley, London, N. W., England, and A. B. EVANS, Highland House, Marehills Lane, Leeds, England. This invention provides an additional delivery cylinder or the like, carrying grippers, the sheet being delivered from the impression surface to this delivery cylinder during the last revolution of the former required for printing, and redelivered to the impression surface at a later period of the working of the machine, so that the sheet to be delivered can pass between the feed-board and the impression cylinder at a time when no sheet is being fed.

### Musical Devices

SPEED CONTROLLER FOR GRAPHOPHONES.—J. H. BRAGDON, 377 Broadway, New York, N. Y. For the patented graphophone the manufacturers of records would be compelled to produce two types of records, one for the old machines, where the disk rotative speed is constant, and another set for the machines where the surface speed is constant; or two kinds of machines must be provided. Because of this it is advantageous to provide a graphophone which is convertible for use with both kinds of records, and the present invention provides a graphophone which can be readily adjusted to obtain a uniform rotative speed for the record or a uniform surface speed thereof.

### Prime Movers and their Accessories

ROTARY ENGINE.—M. A. KRIKORIAN, 318 W. 46th St., New York, N. Y. The compound rotor consists of similar sections, each having vanes, and moving in a common passage and alternating with the vanes of the other section, and wherein the sections are connected to the driving shaft so that when either rotor section moves forward such motion will be imparted to the shaft, while the shaft actuated by one section may move forward freely with respect to the other section and without interference from it. The vanes of the rotor sections act alternately as vanes against which the motive fluid may act to move the section forward, or as abutments against which the fluid may act to move the other section forward. The sections are temporarily locked in alternation from movement with respect to the casing.

### Railways and their Accessories

CAR MOVER.—C. MCCARTER, 721 N. Union St., Decatur, Ill., In the present patent the invention has reference to a contrivance whereby cars can be easily moved on the tracks by a device applied to a car wheel to move the car and the object of the improvement is the provision of a simple, inexpensive and efficient device for the purpose stated.

### Pertaining to Recreation

JOINTED TOY FIGURE.—E. J. READ, 249 Passaic Ave., Rutherford, N. J. The invention provides a new and improved jointed toy figure, representing a human being and arranged to permit of conveniently and quickly changing the positions of the movable members of the figure to represent the figure in various astistic attitudes or poses such, for instance, as assumed by a base ball player in action.

### Pertaining to Vehicles

FENDER.—R. M. PRICE, 1655 N. Dupre St., New Orleans, La. The invention provides a motor fender having supporting means normally holding the fender in elevated position and out of contact with the track or street, and so arranged that when the fender meets resistance, the fender will be depressed into contact with the rails, or street, and at the same time the wheels will be braked, the fender having means in connection therewith and operated by the movement of the fender for controlling the braking mechanism.

VEHICLE WHEEL HUB.—P. DEPFFFER, Kelowna B. C., Canada The invention provides a hub having a hub section and a spoke section which are held yieldingly apart by cushioning means, the spoke section having radial guides for receiving the peripheries of disks which are secured to the hub section and are disposed at the sides of the cushioning means for supporting the latter.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of patentee, title of the invention, and date of this paper.

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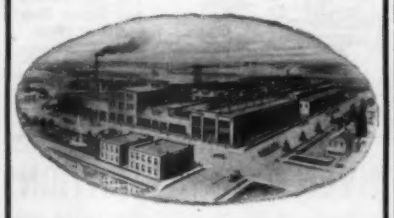

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## When the Surgeon Sews

(*Concluded from page 207*)

that are necessary as much in the material installation as in the technical instruction of the staff. Finally it asks that the tubes of sterilized catgut be subject to government inspection and control, and that on each tube there be placed a mark indicating its industrial origin. Perhaps nothing else could indicate so well as do the existence and recommendation of this committee the place which this ordinarily insignificant industry has come to hold in war-ridden Europe.

## A Recorder of Body Outlines

(*Concluded from page 206*)

suprasternal notch, and the umbilicus. A second and third tracing of the same individual may be made some time later on the same sheet by placing him so that the marks for the fifth spinous process coincide, and repeating the tracing. Thus a record is obtained of the actual change in posture.

The variations produced by inhalation and exhalation, as well as the sagittal flexibility of the the chest, may be obtained by taking successive tracings, one after forced inhalation and one after forced exhalation.

With the thoracometer an accurate record of an individual's posture can be taken in a few seconds. The subject can be made to see clearly any undesirable elements in his posture, and be shown graphically how to correct them. The improvement he accomplishes is recorded by the succeeding tracings. The tracings form, therefore, an accurate basis for grading students as to posture and improvement.

The present method of making a record of the outlines of the human body does not require total exposure of the body, and the record is said to contain nothing that can in any way be objectionable to the subject or render it unsuited for exhibition or demonstration.

## Two Weeks' Review of the War February 15th, 1917

(*Concluded from page 200*)

On the Tigris in Mesopotamia the British claim to have hemmed in the Turkish forces in a bend of the river to the west of Kut-el-Amara, which, if it is true, means disaster for the Turks and for Bagdad

Everything points to most decisive results on all fronts from this spring's operations; at any rate, fewer mistakes will now occur such as the Gallipoli venture, the failure promptly to move sufficient forces in time to save Servia, and the original Bagdad movement. The problem offered will give the General Staffs of both the Entente and Central Allies opportunities to exercise their skill and knowledge of strategical and tactical movements.

## Some Recent Supreme Court Decisions in October, 1916, Term

Three patent cases and one copyright case have been decided by the United States Supreme Court, on Writs of Certiorari and in all four of the cases reversed the opinion below

THE copyright case was that of Victor Herbert, Harry B. Smith. et al., Petitioners, *vs.* The Shanley Co and The John Church Company, Petitioner *vs.* Hilliard Hotel Company and Henri de Martini. In this case Mr. Justice Holmes delivered the opinion of the Court saying that the two cases presented the same question: Whether the performance of a copyrighted musical composition in a restaurant or hotel without charge for admission to hear it infringes the exclusive right of the owner of the copyright to perform the work publicly for profit. Justice Holmes said: "If the rights under the copyright are infringed only by a performance where money is taken at the door they are very imperfectly protected. . . . The defendant's performances are not eleemosynary. They are part of a total for which the public pays, and the fact that the price of the whole is attributed to a particular item which those present are expected to order, is not important.

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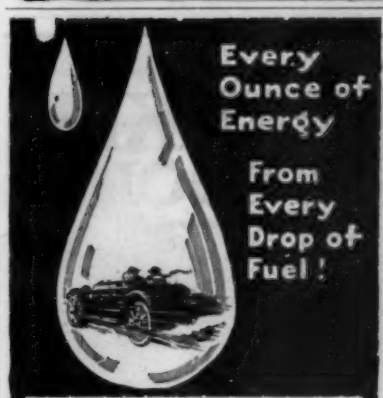


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One patent case was that of the Minerals Separation, Limited, and Minerals Separation American Syndicate, Limited, *vs.* James M Hyde

From the Circuit Court of Appeal of the Ninth Circuit.

The patent in suit was 835,120, of 1906 to Sulman, Hugh Fitzalis Kirkpatrick-Picard and John Ballot, and relates to the flotation concentration and the Supreme Court held claims 1, 2, 3, 5, 6, 7 and 12 valid and infringed, and claims 9, 10 and 11 invalid In the course of the decision the Court, speaking by Mr Justice Clarke, goes somewhat into the history of the flotation concentration processes, and the decision is especially interesting because of such fact.

In the Goshen Manufacturing Company, Petitioner, *vs.* Hubert A. Myers Manufacturing Company and Hubert A. Myers the device in controversy is a Hoisting Pulley, alleged to have been invented by Hubert A. Myers, who, after his application for a patent but before the issue thereof, assigned all of his right and title to Allen P. Boyer, to whom a patent was issued January 21st, 1908, and Boyer thereafter assigned his right and title to the patent to complainant, together with all rights and choses in action in the decision In the decision ohe Supreme Court said: "We have assumed that there was infringing done and threatened and, of course, both assumptions are based on the validity and novelty of the device and that the defendant company's device—that is, the device of patent No. 942,735—is an unsubstantial variation of it Whether the assumption is justified is yet to be decided and in the first instance should be decided by the Circuit Court of Appeals" Its decree dismissing the case was reversed and the case was remanded for further proceedings in accordance with the opinion.

In the case of Cecial F. Adamson, Petitioner, *vs.* Davis C. Gilliland, there was a suit brought for the infringement of a patent for a vulcanizing device, and the decision was handed down by Mr Justice Holmes, who, in the course of the opinion says· "It needs no emphasis to point out the improbability that the defendant at nearly the same time as the plaintiff should have hit by accident upon the same configuration in striking particulars that he regarded as immaterial, and merely to deceive the public, have invented the same by no means obvious explanation that was offered seriously by the plaintiff, but that the defendant regarded as false. The improbability is intensified by a further coincidence also explained by the defendant as accident The lugs by which the cup was to be fastened to the lower surface happened to face in opposite directions in the plaintiff's device, although later they were made to face the same way The defendant's also faced in opposite directions It surpasses the power of belief that a man who testified that there was nothing in the invention, that it was merely arranging to fasten a ladle to a board, should have come by pure chance to make so exact a replica of the plaintiff's specific form."

## Institute of Marine Biology in Sicily

A NEW institute for marine biological research was opened at Messina, Sicily, on December 10th. It is called L'Istituto Centrale di Biologia Marina, and other analogous institutions at Italian seaports are to be subordinate to it. Among the things to be studied here are the migratory habits of fish. The institute building will serve as the headquarters of the Royal Italian Thalasso-graphic Committee


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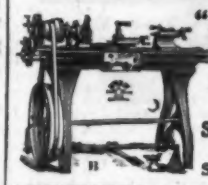

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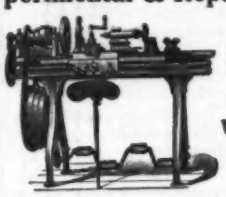

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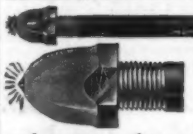

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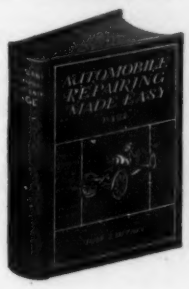

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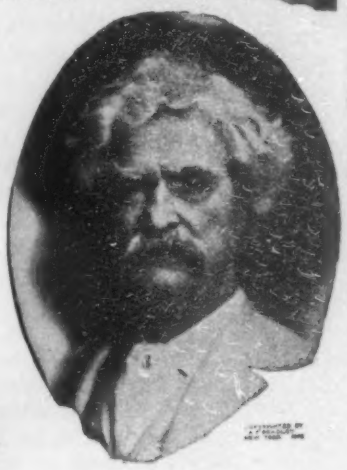
**He could not dream** that one day his work would stand in Chinese, in Russian, in many languages he could not read—and from humble doorman to proudest emperor, all would be gladdened at his coming.

**He could not know** that through it all he would remain as simple, as democratic as he was that day as a boy on the Mississippi.



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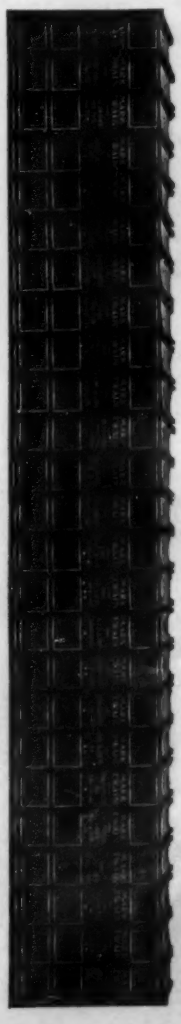

He made us laugh, so that we had no time to see that his style was sublime, that he was biblical in simplicity, that he was to America another Lincoln in spirit.

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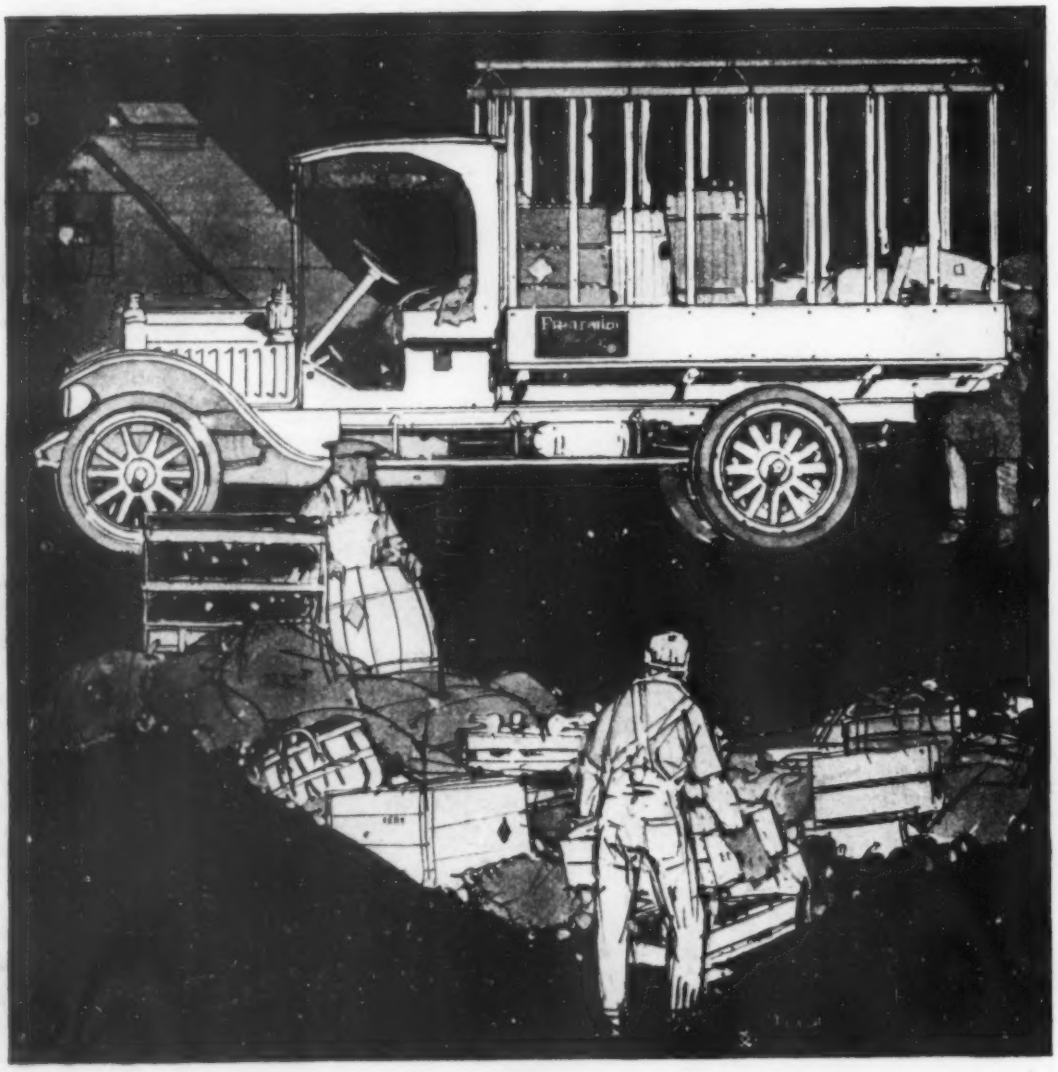

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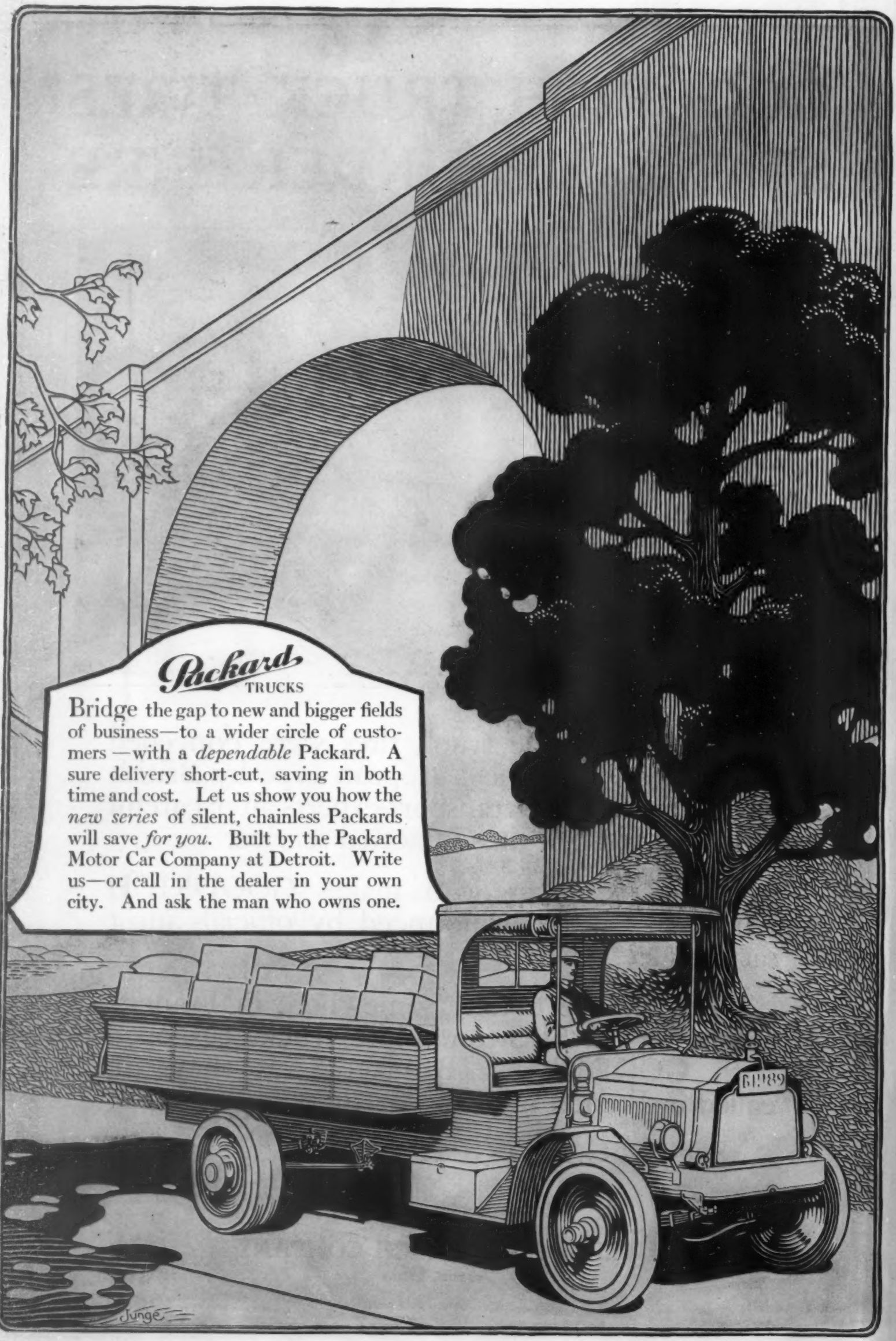
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